WIRELESS LISTENERS' COMPENDIUM

By

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To

My Mother

Who is no more

PREFACE

Radio sways a great force today; but though Radio during peacetime aims at the development of a better universal culture its diversion during war-time to Radio warfare symbolizes the diabolic tendencies in human nature. Its usefulness during normal times cannot, however, be denied. It has a great future.

Truly India is on the verge of a new era in Broadcasting. Broadcast listening has opened up a new field of entertainment which suits a variety of tastes. Radio has indeed created a place in our homes and added to their charm.

How often listeners fail to get optimum results and the real entertainment from their receivers is really surprising. This has, however, arisen from false notions and imperfect knowledge and that, in wireless as in any other field, is a great handicap. Listeners are often disappointed not to find a particular station and it is specially annoying if it is known to be on the air. In most cases it is not through any fault of the receiver but of insufficient information on the part of the listener. Of the numerous stations heard on short waves few people are able to identify even a couple but this is quite simple. Aerial, Earth and Inter-

ference often present baffling problems to the average listener.

This compendium is an attempt to remove most of the difficulties of broadcast listeners but the book is not claimed to be exhaustive. The Author, however hopes that it will meet the requirements even of the most enthusiastic listeners and in a measure it will be useful to the amateur transmitter. The Author will welcome and gratefully acknowledge any suggestions for improvement.

VIRENDRA KUMAR SAKSENA

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LUCKNOW

CONTENTS

A Dictionary of Wireless Terms.

ABAC—Graphs or scales which are used for the determination of unknown quantities and make mathematical calculations unnecessary.

"A" Battery—American equivalent for L. T. (battery used to supply filament current for valves)

Abscissa—The distance of a point from the vertical axis measured horizontally.

A. C.—Alternating Current.

A. C. Resistance—The resistance offered to alternating current.

Acceptor Circuit—A combination of a condenser and an inductance in series and tuned to the frequency of the alternating current applied to it. At this frequency the circuit offers least opposition to the flow of current and hence it is called an 'acceptor circuit'.

Accumulator—A device for storing electricity. Each cell consists of two metal plates immersed in a liquid. and when direct current is passed through it certain chemical actions occur and act as a source of electric current when the charging current is stopped. In use, as a source of electricity, the current flows in opposite direction to the original charging current and lasts only until the plates have returned to the original condition. The cell then requires recharging. In the lead accumulator the plates consist of lead covered with certain chemicals and the liquid is dilute sulphuric acid. Nickel and iron plates immersed in certain alkaline solutions are used in another type of accumulator.

Accoustics—The science of sound.

Adapter—A device which enables an apparatus to perform an additional function.

Adcock Aerial—A type of direction-finding aerial.

Admittance—

$$\text{Admittance} = \frac{1}{\text{Impedance}}$$

(impedance in A. C. circuits is analogous to resistance in D. C. circuits)

Aerial—An arrangement of wires which in combination with suitable apparatus is used to receive or transmit wireless waves.

Aerial Insulators—Pieces of non-conductors of electricity used to insulate the aerial wire from the masts which support it.

Aerial Lead-in—The connecting wire between the aerial and the transmitter or receiver. Precautions are taken to keep it as far removed from trees, buildings and other earth-connected objects as possible. It should also be short and kept away from electric light, telephone and power wires. Failure to observe this precaution may result in the pick up of interference by the lead-in. Specially shielded wire is obtainable which screens the lead-in from interference.

Aerial resistance—The total resistance to high frequency currents of the entire aerial earth system.

Air Condenser—A condenser, fixed or variable, in which the plates are separated by air gaps.

Air Core Choke—A coil of wire wound on a hollow cylinder.

Alternating current—Electric current which flows in alternate directions in a circuit. It starts in one direction from zero, increases to a maximum value, is reduced to zero again and rises to a maximum value in the opposite direction. This complete sequence comprises a cycle. The number of such cycles completed per second is called the **frequency**.

Alternator—A generator of alternating currents.

Aluminium rectifier—An appliance, often called the Nodon valve, which converts alternating current into direct current by means of an aluminium rod and a plate of lead immersed in a solution of ammonium phosphate.

Ammeter—An instrument which measures current in amperes, a unit of current.

Ampere-Hour—A unit which indicates the storage capacity of accumulators. For instance an accumulator having a capacity of 100 A. H (Ampere Hours) can give a current of 1 ampere for 100 hours, 2 amps for 50 hours, 3 amps for 33·3 hours.

Amplification factor—Of a valve is the ratio of change in anode volts to change in grid volts in order to produce the same change in anode current. It is also the product of mutual conductance and impedance of a valve.

Amplifier—A device for increasing the amplitude, of electric current, voltage or power.

Anode—An electrode in a thermionic valve which is given a high positive potential.

Anode dissipation—The power dissipated in the form of heat at the anode of a valve.

Antenna—Aerial.

Anti-microphonic valve—A valve which is not effected by mechanical vibrations.

Aperiodic—Untuned.

Appleton Layer—An ionized layer about 180 miles above the earth. Long distance communication is made possible by the reflection of waves at this layer.

Atmospherics—Electromagnetic waves of an irregular nature produced by atmospheric electrical phenomenon.

Attenuation—Reduction in power or current of a wave.

Audio frequency—The range is approximately 25-10,000 cycles.

Automatic Frequency Control—A self-acting device which corrects the frequency of an oscillator in a superheterodvne receiver in case of any drift from'the correct value. This is usually incorporated in push-button-tuned receivers.

Automatic Grid Bias—Grid bias for valves obtained by the drop of voltage due to anode current through a resistance in the anode circuit.

Automatic Selectivity Control—A system which reduces the selectivity in the case of a strong signal and increases it in the case of a weak one.

Automatic Tuning Control—A means whereby stations may be correctly tuned on a receiver without having to carry out any accurate manual adjustment.

Automatic Volume Control—A device whereby fading is reduced and different stations, weak and strong, are heard at the same strength.

"B" Battery—Battery for supplying anode current for a valve.

Baffle—A board with an opening for mounting a loudspeaker. This improves response at low frequencies.

Ballast Valve—see Barreter.

Band Pass Filter—A tuning circuit which allows currents of frequencies between a certain range and rejecting the rest.

Barreter.—A valve which tends to maintain a constant current while the voltage applied across it is varying. Usually it consists of a fine filament in an atmosphere of hydrogen.

Battery Eliminator—An appliance which enables apparatus to be worked from mains, thus eliminating batteries.

Beam Transmission—The transmission of wireless waves in narrow beam to eliminate the waste of energy in undesired directions and concentrating only on the required path, thus producing large field strengths.

Bellini-Tosi System—A direction-finding system.

Blasting—The distortion produced when a valve is overloaded.

Blocking condenser—A fixed condenser used for eliminating D. C. from A. C. circuits

Bright emitter—Valves with tungsten filaments which have to be heated to a high temperature for the emission of electrons.

Broadcasting—Radio transmission having entertainment value and intended for general reception.

By-Bass Condenser—A condenser used to provide an a. c. path across a circuitof a comparatively lower impedance.

"C" Battery—Grid-bias battery.

Capacitive Coupling—The inter-connection of two circuits by a common capacity.

Carbon Microphone—A form of microphone in which the property of carbon granules to change their resistance with changes in pressure is utilized for converting sound waves into electrical currents.

Carrier—A term used to designate carrier wave, carrier current and carrier voltage.

Carrier Frequency—The frequency of a carrier wave.

Carrier Suppression—A method of transmission in which the carrier wave is suppressed at the transmitter.

Carrier wave—A wave on which modulation is imposed and which makes the transmission of a signal possible.

Cathode—The electrode in a thermionic valve which emits electrons.

Cathode Current—The total current passing to or from the cathode through the vacuous space. The term should be carefully distinguished from filament and heater current.

Catkin—A valve in which the outer envelope serves as the anode.

Cat Whisker—A wire used to make contact with a crystal in a crystal detector.

Choke Coil—An inductance coil used to offer a relatively high impedance to alternating currents in a circuit.

Class A Amplifier—An amplifier which operates in such a manner that the plate output wave form is essentially the same as that of the exciting grid voltage.

Class AB Amplifier—An amplifier which is over-biased operating as a Class A system for small signals and as a Class B amplifier when the signals are large.

Class B Amplifier—An amplifier which operates in such a manner that the power output is proportional to the square of the grid excitation voltage. This is done by operating with a negative grid bias such that the plate current is reduced to a relatively low value with no grid excitation voltage and by applying excitation such that pulses of plate current are produced on the positive half cycles of the grid voltage variations.

Class C Amplifier—An amplifier which operates in such a manner that the output varies as the square of the plate voltage. This is done by operating with a negative grid bias more than sufficient to reduce the plate current to zero with no excitation.

Condenser Loudspeaker—A loudspeaker in which electrostatic forces accomplish the conversion of electrical into sound energy.

Condenser Microphone—A microphone which consistes of a condenser the capacity of which undergoes changes by the impinging sound waves.

Conversion Conductance—It is the ratio of the intermediate frequency component of the plate current or output current of the converter valve in a superheterodyne raceiver to the radio frequency component of the signal voltage applied to the signal grid.

Conversion Gain—It is the ratio of the intermediate frequency voltage developed across the load to the radio frequency voltage applied to the control grid.

Converter—In a superheterodyne receiver, a valve which simultaneously generates oscillations and mixes them with the incoming signal.

It is also an electrical machinery for the conversion of D. C. into A. C.

Counterpoise—A network of wires spread underneath the aerial a little above the ground and insulated from it to serve as an earth.

Coupling—It is the association of two circuits in such a way that power may be transferred from one to the other.

Cross Modulation—It is a type of intermodulation due to the modulation of the carrier of the desired signal by an interfering one.

Crystal Control—A device for the stablization of the frequency of oscillotion of a valve by means of a crystal.

Crystal Detector—A detector of high frequency waves which consists of a crystal in contact with a pointed wire.

Cycle—See Alternating Current.

Damped Oscillation—Oscillations which are continually decreasing in amplitude and finally die out.

D. A. V. C,-Delayed—Automatic Volume Control.

Decoupling—Method whereby interaction between different valve-stages is avoided.

Demodulation—Process whereby the modulation frequency component is separated from the carrier frequency.

Detector—See Demodulation.

D. F.—Direction Finder.

Diaphragm—A surface which when vibrating emits sound.

Diode—A valve having two electrodes, an anode and a cathode.

Diode Rectification—A method of rectification employing a Diode Valve.

Direct Current—Current flowing in one direction only.

Distortion—A change of the wave form occurring in a circuit when the output wave form is not a true replica of the input wave form.

Double Diode Triode—A valve containing two diode valves and a triode valve in a single envelope.

Dynamic Loudspeaker—A moving coil Loudspeaker.

Electrolytic Condenser—A condenser in which the anode is of Aluminium and the dielectric is a very thin gas film.

Electron—The smallest negative charge ; the unit of negative charge.

Electron Emission—Liberation of electrons from an electrode into the surrounding space.

Electron Valve—An evacuated valve the electrical characteristics of which are essentially due to electron emission.

Exponential Horn—A loudspeaker of such shape that the cross-sectional area is an exponential function of the length.

Facsimile transmission—Transmission of pictures etc. by electricity.

Fading—Fluctuation of signal strength of a received signal due to atmospheric condition.

Feed-back—Feeding back of energy ; regeneration ; recation.

Fidelity—Degree to which a system reproduces at its outpnt the form of the signal which is impressed upon its input.

Filament—The wire which emits electrons in a valve.

Filter—A selective circuit designed to pass a conti-

nous band or bands of frequencies while greatly reducing the undesired frequencies.

Frequency—The number of cycles per second.

Frequency Changer—A valve in a heterodyne receiving system which changes the frequency of a carrier wave.

Frequency Modulation—Modulation produced by varying the frequency of a carrier wave.

Full-wave Rectification—A method of rectification in which both positive and negative half-cycles are rectified.

Ganging—of tuned circuits, mechanical coupling of variable elements.

Gramophone Pick-up—An apparatus which, when used in place of a soundbox in a gramophone, generates electrical currents corresponding to sound waves. These currents are amplified by an amplifier and reproduced through a loudspeaker.

Grid—An electrode in a valve, with a mesh-like, structure through which electrons can pass.

Grid Bias—The grid voltage applied to a valve for proper functioning.

Grid Leak—A resistance in the grid circuit of a valve.

Half-Wave Rectifier—A rectifier which changes alternating current into direct current and utilizes only one half of each cycle.

Hard Valve—A valve with a high vacuum, the pressure being .001 mm of mercury or less.

Harmonic—A frequency which is an integral multiple of the fundamental frequency.

Heater—Filament used to heat up the cathode in an indirectly heated valve.

Heaviside Layer—An ionised layer enveloping the earth at a distance of about 60 miles.

Heptode—A valve having a cathode, five grids and an

anode used as a frequency converter in superheterodyne receivers.

Heterodyne—The production of sum or difference frequencies.

H. F. Pentode—A pentode valve used for high frequency amplification.

H. T. Battery—A battery for supplying anode current to a valve.

Howling—Low frequency oscillations produced in a receiver.

Indirectly heated cathode—The cathode of a thermionic valve which is heated up by a separate filament.

Inter-electrode capacitance—The capacitance between the electrodes of a valve.

Interference—Unwanted intermingling of reception with strays and undesired signals.

Intermediate Frequency—In Superheterodyne reception, fhe frequency generated by mixing the signal currents and local oscillations.

Interrupted C. W.—High frequency waves produced by the interruption of continuous high frequency currents at audio frequency, used for morse signalling.

Jamming—Interference produced by a signal at a neighbouring frequency.

Johnson Noise—Noise produced in thermionic valves due to thermal agitation of electrons.

Lead-in—That portion of the aerial installation which connects the aerial wire to the receiver.

Litz wire—Composite wire consisting of fine strands which pass out along the surface for part of their length.

Loaded Aerial—It has an inductance Coil in series which increases the wavelength to which it responds most.

Load Resistance—Total effective resistance in the plate

circuit external to the valve.

Loose Coupling—A form of coupling in which the coefficient of coupling is small.

Loudspeaker—A device for reproducing sound from electrical currents.

Magnetic Screen—A screen of iron or copper to shield from external magnetic effects.

Magnetron—A valve in which the electronic currents are guided by magnetic fields.

Man-made Static—Interference produced by electrical machinery.

Master Oscillator—An oscillator of low power for the sole purpose of producing constant frequency oscillations.

Matched Impedance—The output of a power valve is greatest when the impedance of the loudspeaker is matched to valve impedance. That impedance is called the matched impedance.

Maximum Peak Inverse Voltage—The highest peak voltage that a rectifier can safely withstand in opposite direction to that in which it is designed to pass current.

Maximum Peak Plate Current—The highest peak current that a rectifier can safely stand in the direction in which the valve is designed to pass current.

Mechanical Rectifier—It is a rectifier which depends for its action on mechanical commutation.

Metal Rectifier—A rectifying device which uses electrodes of copper and lead separated by a layer of copper oxide.

Metallized Valve—A valve which has a glass bulb sprayed with metal, usually Zinc.

Microphone—A device for converting sound vibrations into electrical impulses.

Microphonic Valve—A valve the electrodes of which

begin to vibrate if sound vibrations impinge on it.

Miller Effect—Feed-back resulting from grid-plate capacitance.

Mixer Valve—See Converter.

Modulated Wave—A wave of which either the phase, amplitude or frequency is varied in accordance with sound vibrations.

Modulation—The process whereby the amplitude, phase or frequency of a wave is varied in accordance with a signal.

Modulation Distortion—It is caused by the unequal attenuation of side-bands.

Modulation Factor—Ratio of half the difference between the maximum and minimum amplitudes of a modulated wave to the average amplitude.

Modulator—The device which produces modulation.

Monkey Chatter—It occrs when the wanted and unwanted side-bands produce beats.

Motor Boating—Low frequency oscillations produced by the energy which is fed back.

Moving Coil Loudspeaker—Such a loudspeaker has a coil which is movable in a magnetic field. The coil carries the speech currents.

Mutual Conductance—Ratio of the amplification factor to the plate resistance of a valve.

Neutralizing Coil—A coil placed in series with the moving coil of a loudspeaker to neutralize hum which is introduced due to the ripple in the D. C. supplying the field current.

Oscillator—A valve circuit in which energy is fed back for the production of oscillations.

Pantode—A thermionic valve containing one anode, a cathode and three grids.

Percentage Modulation—Modulation Factor x 100

Permeability Tuning—A method of tuning in which inductance is varied by a movable iron dust core.

Photo-electricity—The science of the liberation of electrons bʒ electromagnetic waves (including light)

Power Amplification—Ratio of A. C. power secured in the output circuit of an amplifier to the A. C. power supplied in the input circuit.

Power Output—The A. C. power produced in an external non-inductive resistor of specified value connexted in the plate circuit of the amplifier.

Power Valve—A valve used for power amplification.

Proton—The unit of positive electricity.

Pulling—The tendency of the received wave to pull in the oscillator into step if the frequencies are close to one another.

Pulsatance—2 x $\overline{\Lambda}$ x f.

Push-Pull—A method of amplification using a couple of valves in the balanced condition.

Q. P P.—Quiescent Push Pull. It is a push-pull output stage, the grids being biased much more negative.

Radiation—The transmission of electromagnetic waves.

Radiation Resistance—That hypothetical resistance of the aerial which on multiplication by the R. M. S. Value of the aerial current gives the radiated power.

Radio Beacon—The transmitters radiating waves for ships and aeroplanes to enable them to locate their position by means of Direction-Finding apparatus.

Radio Receiver—A receiver for converting wireless waves into sound waves.

Radio Transmitter—Apparatus for producing and transmitting wireless waves.

Reaction—Feeding back of energy from anode to grid circuit.

Rectification—Conversion of alternating into direct current.

Reflex Circuit—Such a circuit system in which amplification takes place both before and after detection in the same amplifier valve or valves.

Rejector Circuit—A circuit comprising a condenser and inductance connected in parallel ; this offers a high impedance to waves of a particular frequency thus rejecting it and accepting the rest.

Resistance Capacity Coupling—The coupling of one circuit to another by capacity and resistance.

Resonance Frequency—That frequency to which a circuit produces the greatest response. The circuit may offer the highest (rejector circuit) or the lowest (acceptor circuit) impedance at that frequency. At resonance frequency the supply current and voltage are in phase.

Response Curve—A curve giving the relation of the output to input voltage at various frequencies.

Screen Current—The current that flows to the screen grid of a valve.

Screen-grid Valve—A valve having one anode, a cathode, a control grid and a screening grid which shields the control grid from the anode.

Selectivity—The ability of a receiver to discriminate between incoming signals of different carrier frequencies.

Sensitivity—The ability of a receiver to respond to signals whose frequency corresponds to the one for which the receiver is tuned.

Shot or Schottky Effect—Noise caused in valves by the random motion of electrons.

Side Bands—Frequency bands, one on either side of the carrier frequency, resulting from the modulation process.

Side Band Splash—The twittering sound produced when an unwanted side band beats with the wanted carrier.

Signal—Anything communicated.

Single Side Band Transmission—A method of transmitting wireless waves in which one side band is suppressed and the other transmitted. The carrier may or may not be transmitted.

Skin Effect—The phenomenon that high frequency currents travel over the surface of a conductor and not through it.

Skip Distance—Sometimes short waves are received beyond a certain distance and there is no reception within the intervening space called the skip distance.

Smoothing Circuit—A low pass filter for smoothing out rectified A. C. or pulsating D. C.

Soft Valve—A valve which contains gas.

Space Charge—Electrons after being emitted from the cathode cluster round it and form a cloud of charge in the absence of an accelerating potential on the grid.

Static—Atmospherics.

Superheterodyne Receiver—In a Superheterodyne Receiver the modulated h. f. currents after beating with locally generated oscillations are rectified to produce intermediate frequency currents which on further rectification reproduce the signal.

'T' Aerial—A horizantal Aerial, the down-lead being connected to the middle point of the aerial.

Television—Transmission of scenes or pictures by translating minute portions of them at a time in a sequence (scanning) into electrical currents which are superimposed (modulation) on h. f. currents and transmitted.

Tetrode—A valve with four electrodes.

Thermionic Emission—Emission of electrons under the influence of heat.

Tone Control—A device for varying the frequency-response of an amplifier.

Tone Correction—A method whereby the attenuation of high audio frequencies resulting from high selectivity circuits is corrected for by an amplifier with a rising frequency response characteristics

Trimmer—A small semi-variable condenser used for ganging condensers.

Triode—A three electrode valve having an anode, a grid and a cathode.

Tuned Anode—A method of high frequency amplification in which the anode load is a parallel tuned circuit.

Tuning—The adjustment of a circuit in relation to frequency for optimum performance.

Variable-Mu Valve—A valve of which the mutual conductance varies with the applied bias.

Visual Tuning Indicator—Any kind of visual indicator for tuning operation. This simplifies tuning.

Volume Expansion—A circuit arrangement which amplifies strong signals more than weak ones. The action is not very quick for otherwise the relative loudness over short periods will be reduced to a negligible proportion.

Wired-Wireless—The transmission of high frequency currents along wires

X's—Atmospherics.

How much do you know ?

AERIAL

1. In Aerials height is of the utmost importance, but by height is meant 'effective height'.

2. An aerial which consists of a wire a couple of feet above the roof of a building a hundred feet or so high does not constitute a hundred-foot aerial.

3. An aerial which passes over houses is less effective than one with nothing in between it and the earth.

4. An aerial which runs vertically up the side of a house and close to the walls will be a poor aerial.

5. The two things to aim at are height and remoteness from, walls, house wiring, neighbouring aerials, power lines, telephone wires and conducting materials generally.

6. A good aerial is about 30 feet high and 60 feet long.

7. The aerial wire should be properly insulated at each end by at least two insulators.

8. The lead-in wire should be soldered to the aerial wire proper.

9. The best indoor aerial is of the roof type in which a wire is fixed round the loft.

10. Two or more wires running in a straight line are sometimes fixed up inside a loft at least 6 feet apart and joined together at the ends.

11. In reinforced concrete buildings the walls are full of metal and the windows often have lead frames and lead glass panes; under such cicumstances it is desirable to tune your radio with the windows open.

12. When working with a portable set reception

from a station is always strongest with the frame lined up in the direction of the station.

13. Cracking in the loudspeaker may be produced by the intermittent contact of a faulty joint, the rubbing of the aerial against trees or walls etc.

14. There is little chance for lightning to strike a receiving aerial but it is usual to protect receivers against lightning by means of lightning arresters which are installed outside the house and provide an easy path for lightning.

15. Care should be taken to see that there is no leakage or an actual short-circuit caused by the lightning arrester.

16. When the receiver is not in use the aerial should always be connected to earth .

17. Outdoor aerials often take up a high charge during storms and it is desirable not to use an outdoor aerial during a stormy weather. Aerials are often found to impart a powerful shock under such circucmstances. (Cases have been reported where motor cars driven at a high speed through a dust storm accumulate sufficient charge to impart a shock on touching the body of the car, just after the drive, while standing on the ground).The charge is often high enough to produce continuous sparking (for the duration of the storm) if the aerial is at any point touching the earth or the wall.

EARTH

18. Gas and water pipes are not advisable for earth connection to a receiver as they are often found to give noises in a receiver if they move under the influence of vibration.

19. A good earth can be made by burying a Copper, Zinc or galvanized Iron plate, two or three feet square, upon its edge as many feet below the surface as one has energy to dig—preferably not less than three feet.

20. It is much better to bury an earth plate a few feet away from the wall of a house if the ground near the wall is sheltered and therefore drier.

21. The earth lead from the receiver should be of a fairly heavy gauge. such as 7/22 (7 strands of 22 S. W. G. wire) and need not be insulated if the lead is short.

22. The wire should be soldered to the plate at three or four points to ensure proper contact in case of corrosion or breakage at one of them.

23. The earth lead from the receiver should be as short as possible, but if a much better earthing point is to be obtained with a lead a few feet longer, the better should be used.

24. A long earth lead, where unavoidable, should be insulated.

25. Twin earth leads should not be used in view of risk of setting up erratic effects.

26. As an alternative to burying a plate, an earth tube is very often used. In favourable soil it proves an efficient earth. It can be driven straight into the ground and is much easier to instal.

27. An earth tube should be made of Copper, since part of it projects above the ground where it is practically liable to corrosion.

28. Sometimes earth tubes containing a special chemical are used. The chemical spreads through the surrounding soil and improves its conductivity.

29. A solution of salt and water poured down an earth tube is also effective in improving the conductivity of the surrounding soil.

30. Weak reception of distant stations during summer is often traceable to dryness of the earth connection.

31. Watering the ground occassionally around the earth tube is a wise plan in dry weather.

32. Rocksalt or ammonium chloride (Nausadar-Hindustani) improves an earth connection.

33. It is often found on disconnecting the earth lead that very little difference is made to the sensitivity of the receiver.

34. This may be a sign that the earth is faulty.

35. Or in the case of mains receivers it may be due to the considerable capacity between the wiring and the mains leads through the mains transformer—one of the mains being earthed. Any change in volume may be masked by the automatic volume control which compensates foı the reduction caused by the removal of the earth lead.

36. In practically all cases an earth lead is a decided advantage, though that may not be immediately apparent.

37. Although there may be quite effective indirect paths to earth, a direct earth helps to stabilize the receiver and also to reduce certain kinds of ineterference.

38. In the case of Universal and D. C. receivers an earth may be a disadvantage.

39. On D. C. Mains a considerable amount of interference may sometimes be brought to the receiver where there is a difference of potential between the earthed main and the earth.

40. This apparently strange effect may be due to the voltage drop on the earthed main, or a bad earth at the supply station.

41. In such cases removal of the direct receiver earth may reduce or eliminate the interference.

INTERFERENCE

42. Noise in radio reception comes from three sources, faulty parts and connections in the receiver itself, natural static or man-made static.

43. To avoid noise from faulty parts and connections

have your radio set examined by an engineer quite regularly.

44. No device has yet been perfected, though there are many which suppress certain types of noises, for the elimination of natural Static.

45 Natural static is not so troublesome on shoit as on medium and long waves

46 Atmospherics are bad only on odd days and nights. They are usually most troublesome in summer. The crackles always occur at irregular intervals and never follow one another at fixed periods of so many seconds.

47. If crackles are heard all day and every day and if they are at their worst at certain hours or at certain days of the week or if they occur at regular intervals when you can be quite sure that they are due to electrical machinery. This is called man-made static.

48. A characteristic of man-made static that is mystifying is that while its direct radiation is very limited it may be carried great distances by electric power lines or telephone lines.

49. Noises thus carried by electric power lines do not reach the receiver through its connections to the mains. The design of most good receivers ensures this.

50. The noises usually are carried to the vicinity of the aerial or aerial lead-in by the power line from where they are reradiated and picked up by the aerial or the lead-in along with the broadcast programme,

51. To find out whether noise is reaching the receiver through the wires connecting it to the mains, disconnect the aerial and listen. If the noise disappears it is coming via the aerial (see also 50) otherwise if it persists it is entering through the mains connections.

52 In the above case noise can be reduced considerably by connecting choke-condenser filters (which are available

ready-made) at the Metre Board and at the socket.

53. It is, however, best to suppress noise at the apparatus causing interference.

54. If the aerial is picking up noise (it may be the re-radiated interference) a noise reducing aerial of which there are several varieties will greatly minimise man-made interference.

ACCUMULATOR

55. An accumulator is a device which may be used repeatedly for the storage of electrical energy. During the process of charging energy in the form of electricity is put into the accumulator and this energy is given in the same form during discharge.

56. Acid in accumulators can be rendered non-liquid (gelatinous) by adding sodium silicate to the acid.

57. A non-spillable accumulator may be obtained by adding sodium silicate until the desired consistency is obtained.

58. The capacity of accumulators is indicated in Ampere-hours which is the product of the current taken from the accumulator and the time in hours for which such a current can be obtained. Thus a 100 A. H. accumulator can give 1 Ampere for 100 hours, 2 Amperes for 50 hours and so on.

59. Beware of over-discharging your accumulator, or worse still leaving it for long periods in a partially discharged condition.

60. As soon as reception shows any sign of weakening due to the accumulator being run down take it off and get it recharged at once.

61. An accumulator fully charged has a voltage of 2.2 volts.

62. An accumulator gives a steady voltage which

does not fall below 2 volts per cell throughout the whole of its useful discharge period and as soon as it falls below 2 volts it is time to get it recharged.

63. It will go on discharging and your set may go on working until it is well below this figure, but rapid deterioration of the accumulator sets in when it is discharged below 1·8 volts and although you may not notice ill effects at first you will find your accumulator deteriorate rapidly and become quite useless after a few months more of work.

64. The accumulation of dirt and moisture allows the current to leak away and reduce the efficiency of an accumulator.

65. Corrosion is best prevented by removing all traces of acid from terminals and connections and then coating all metal parts with vaseline.

66. A hydrometer is the best indicator of the charge in an accumulator. One should always be used in conjunction with a voltmeter.

67. The Air Cell batteries introduced by Eveready do not need recharging and last for a few thousand hours.

68. Where electric power is not easily available accumulators can be charged by wind-operated electric generators. They are however, useful only where there is always a good breeze, such as on sea-shores.

MISCELLANEOUS

69. In listening to foreign short wave stations, remember to take into account the differences in local standard times. Stations are most likely to be on the air during the evening hours (6 to 11 p. m.), their local standard time.

70. In mains receivers the fuse is an important safeguard.

71. A. C. Mains units should be protected by means of fuse on the input and on the output portions.

72. D. C. Mains receivers should have a fuse in both the mains leads

73. D. C. Mains receivers can be worked off A. C. Mains with the help of an inverter.

74. The inverter is just the opposite of a converter and thus generates D. C. from an A. C. source.

75. A. C. Mains receivers (or other A. C. apparatus) which are intended for operation from 50-cycle mains should not be used on mains of lower periodicity (for instance 25 c/s).

76. A. C. Mains receivers, not provided with a fuse if plugged into D. C. mains burn out the mains transformer.

77. D. C. and A.C/D.C. receivers will work from D. C. Mains only if the receiver plug is properly connected to the mains socket. The positive end of the plug should go to the positive pole of the mains.

78. When working a battery receiver from the mains by means of an eliminator it is desirable to connect fixed condensers in both aerial and earth leads.

79. Gramophone records which are warped can be flattened out by placing them between two glass sheets in a warm place.

80. Gramophone needles are available which can play several records without the point wearing out.

81. Gramophone records can be played back through a radio by means of a pick up which is used in place of a soundbox.

82. Receivers are available which can work from Battery. A. C. or D. C. Mains.

83. Receivers are available (with automatic tuning) in which you get the desired station by pressing a button.

84. Receivers are available (with band-spread tuning) in which the various short wave bands are spread over

a length of several inches thus making tuning very much easier.

85. Where appearance is not of primary importance a flat baffle (for a loudspeaker) is preferable to any form of cabinet.

86. Corrosion increases the H. F. resistance of wires.

87. Headphones should always be joined to a mains receiver through fixed condensers.

88. Ordinary flex leads should not be untidy with straggling whiskers. A little sealing wax or rubber solution will keep them quite neat.

89. Wireless waves are propagated through space via the great circle path.

90. Ordinary map projections do not give the correct direction of a place.

91. A globe offers, probably, the best means of ascertaining the direction of any place.

92. It is a good practice to cover up the radio, when it is not in use, to prevent dirt and moisture from getting in.

93. Dirt deposited on chassis and components can be blown out with a bicycle pump. Small bellows serve admirably.

94. Pipe cleaners are ideal for removing dirt from between the vanes of variable condensers. This, however, requires great care as any undue pressure on the vanes may disturb ganging.

95. The deterioration in quality of reproduction of a radio receiver is generally a sign that one or more valves need replacing.

96. Volume controls should be replaced when they produce a grinding noise or crackles during operation.

97. Local station should not be tuned-in at full volume for fear of damage to the receiver.

98. Stations should be tuned-in very accurately to get the last ounce of fidelity.

99. Do not look for short wave stations above 31 metres during daylight and below 25 metres after dark.

100. Medium and long wave stations are heard better after nightfall.

Some Wireless Don'ts.

1. Don't get discouraged if reception is poor one night; it may be fine the next.

2. Don't tune above 31 metres for distant stations in daylight.

3. Don't tune below 25 metres for distant stations after dark.

4. Don't expect to find stations on all parts of the dial. Short wave stations are widely separated except in a few instances.

5. Don't skim over the dials. Tune very slowly listening for weak signals.

6. Don't use the maximum volume for the local station. The quality is impaired and there is danger to the loudspeaker and other components.

7. Don't pull a valve out of its holder by the glass bulb. Always take hold of the base of the valve.

8. Don't make any change in the anode and grid voltages of a battery receiver without first switching off filament current (L. T.)

9. Don't leave the aerial connected to the set while not in use. Always connect the aerial to the earth.

10. Don't work a radio receiver which is meant for operation from 50-cycle A. C. mains on mains of lower frequency.

11. Don't try to displace wiring in a commercially made radio receiver in an attempt to make it look more neat.

12. Don't meddle with any trimmimg condenser unless of course you know all about it.

13. Don't fiddle with volume and tone controls; they have a limited period of useful life after which they begin to develop noise and have to be replaced.

14. Don't work your radio in a half-hearted mood it is better to switch it off and conserve valve-life, which is limited, for enjoyable occasions.

Some False Notions

1. Thinking of a 4-volt battery as being twice as powerful as one giving only 2 volts, do not imagine that 4-volt valves must have similar superiority over 2-volt valves.

2. The covered wire does not possess miraculous properties for aerials.

3. Do not believe that the thicker the aerial the stronger must be the signal in direct ratio.

4. Do not imagine that the wavelength of a station represents the length of the aerial most suitable for receiving a particular station.

5. Do not imagine that the wavelength of a station represents the radius over which the station can be heard.

6. Do not imagine that long wave stations are heard over very long distances.

7. It is wrong to say that a 10 valve receiver will last twice as long as a five valve one.

8. It is erroneous to think that fading is due to any fault in a radio receiver—it is a natural phenomenon but circuits have been evolved which considerably minimise fading.

9. It is a very common notion, though undoubtedly wrong, that while working a receiver, generally, at a low volume less power is consumed. A very few battery receivers do incorporate a battery economy switch.

10. Ventilation of air is not necessary for the reception of wireless waves. In fact reception is possible in a completely airtight room. There is, however, a little screening effect of the walls particularly if they are wet.

11. Do not imagine that an aerial one foot above a roof which is itself 100 feet high makes an aerial of 100 feet effective height. It is the height above earthed objects that matters.

12. Do not think that metal valves can stand rough handling whereas glass valves cannot. It is not the glass envelope that is delicate but the inner structure.

Radio Waves and the Ionosphere

The directions which the wireless waves take in travelling from one place to another follow the great circle path (a great circle is a circle passing through two points on the surface of a sphere such that it has the largest possible diameter). The great circle paths can be easily determined from a globe. In setting up directional aerials great circle paths must be known.

From a transmitting aerial two distinct sets of waves are radiated. The first of these is known as the ground wave because it follows the surface of the earth. It gradually becomes weaker since its energy is taken up in overcoming resistance, and by absorption over the ground that it travels. However, it remains usually sufficiently strong upto 75 miles to provide good reception. The second wave known as the sky-wave travels outwards and upwards. High above the earth this sky-wave encounters an ionized belt known as the Heaviside layer. During daylight the Medium and Long wave transmissions that reach this layer are almost completely absorbed so we have to rely on ground-wave reception. This accounts for why Medium and Long wave stations are comparatively weak until after dark. After dark the layer reflects instead of absorbing the waves, thus widely increasing the range.

Enveloping the earth there exist at least two well-defined layers :

(1) The F Layer 180 miles above the earth, called the Appleton layer, and
(2) The E Layer about 60 miles above the earth, called the Heaviside layer.

Radio waves above about 3 Mc/s. (below 100 Metres) are propagated by means of bending and reflection in the

F Layer and the amount of bending depends upon the frequency and the density of ionization in the layer in the following manner:-

(1) the lower the wavelength the smaller is the bending and consequently it is less likely for the wave to be reflected

(2) the smaller the density of ionization the smaller is the bending The density of ionization is higher during the day than at night.

It is therefore quite apparent that at night reception is not usually possible on wavelengths up to 25 metres (approximately) because the waves are not reflected, they penetrate the layers and go far out into space. During the day ionization is greater and reflection is possible on lower wavelengths down to 11 metres But during the day waves above about 49 metres are heavily absorbed by the ionized layers and reception is therefore not usually possible on wavelengths higher than 49 metres.

On short waves although two waves are again sent out, the ground ray is very rapidly absorbed. The sky-wave penetrates the Heaviside layer and is reflected back by the second layer, 180 miles up. This layer reflects most of the waves back to earth at such an angle that the signals come back many thousands of miles away from the transmitter. As there is no ground wave. reception depends entirely on the sky-waves.

A phenomenon known as skip-distance must also be considered. The area between the transmitter and the point where the reflected wave comes back to earth is almost without signals The waves skip over the zone.

From what has been said already it will be apparent that different wavelengths will have skip zones of varying lengths and different maximum range, both of which will be different for day and for night.

The following table gives the useful range for day and

for night transmission for different wavelengths.

Wavelength	Range for daylight prevailing between the transmitter and the receiver.	Range for darkness prevailing between the transmitter and the receiver.
16 Metre Band	600—8000 miles	Reception not possible
19 ,, ,,	500—5000 ,,	2000—3000 miles uncertain
25 ,, ,,	350—2000 ,,	900 —9000 ,,
31 ,, ,,	250—1500 ,,	600 —9000 ,,
41 ,, ,,	120— 800 ,,	300 —7000 ,,
49 ,, ,,	50 — 600 ,,	70 —6500 ,,
61 ,, ,,	upto 500 ,,	upto 6000 ,,
75 Metres	,, 400 ,,	,, 5000 ,,
91 ,,	,, 200 ,,	,, 1500 ,,
100 ,,	,, 150 ,,	,, 800 ,,

The following reception problems can be solved with the help of this chart.

(1) Suppose you want to know whether a 31- metre station can be received at a particular time.
Find out the distance of the transmitter from the receiver (the great circle distance) and consult the appropriate column in the above table. If the distance falls within the range reception is likely.

(2) You can know which wavelength will be most suitable for searching stations of a given country, and

(3) the most appropriate time for searching a station at a particular wavelength at aknown distance.

Reception Reports

If one is asked to send a reception report, generally it will not do to describe the condition of reception in words. Certain International conventions have to be followed in giving a comprehensive report.

THE R—S—T SYSTEM

This system is mostly used by amateurs all over the world. Here

R stands for readability
S. stands for signal strength
T. stands for tone.

The interpretation of the numerals used is given in the following table.

The letters R-S-T determine the order of sending the report. Such a reception report as RST 465 X will have the following interpretation—Signals readable with practically no difficulty; good singnals; musically modulated note ; crystal characteristics noticeable.

THE R—SYSTEM

In this system which is most commonly used for broadcast reception reports, signal strength, fading and atmospherics are given. Symbols and their interpretation are given in the following table.

R-S-T SYSTEM

Numeral	Interpretation
	(R) Readability
1	Unreadable
2	Barely readable, occasional words distinguishable
3	Readable with considerable difficulty
4	Readble with practically no difficulty
5	Perfectly readable
	(S) Singnal Strength
1	Faint—signals barely perceptible
2	Very weak signals
3	Weak signals
4	Fair signals
5	Fairly good signals
6	Good signals
7	Moderately strong signals
8	Strong signals
9	Extremely strong signals
	(T) Tone
1	Extremely rough hissing note
2	Very rough a. c. note, no trace of musicality
3	Rough low-pitched a c. note, slightly musical
4	Rather rough a. c. note, moderately musical
5	Musically modulated note
6	Modulated note, slight trace of whistle
7	Near d. c. note, smooth ripple
8	Good d. c. note, just a trace of ripple
9	Purest d. c. note

If the note appears to be crystal controlled add an X after the appropriate number.

(R)-SYSTEM

Symbol	Interpretation
	Signal Strength
R1	Faint signals, just audible
R2	Weak signals, barely audible
R3	Weak signals, copiable (in absence of any difficulty)
R4	Fair signals, readable
R5	Moderately strong signals
R6	Strong signals
R7	Good strong signals (such as copiable through interference)
R8	Very strong signals; can be heard severel feet from phones
R9	Extremely strong signals
	Fading
F	Slight Fading
FF	Fairly deep fading but no programme lost
FFF	Complete fade-out programme lost
N	No fading
SS	Very slow fading (minutes)
S	Slow (one minute or so)
R	Fairly rapid (several seconds)
RR	Very rapid (one second or less)
	Atmospherics
X	Slight static
XX	Rather bad
XXX	Very strong atmospherics
N	No atmospherics

Time in Different Countries

Every fifteen degrees of longitude make a difference of an hour. Places 15 degrees East (from any place) are an hour ahead and those 15 degrees west are an hour behind. Therefore at the same instant the local time at different longitudes is different.

Different countries adopt different standard times to suit their convenience. The following are some of the well-known standard times; their relation to the Indian Standard Time (I.S.T.) is also given

Eastern Standard Time (E. S. T.)	10½ hours slow on I. S. T.
Greenwhich Mean Time (G. M. T.)	5½ hours slow on I. S. T.
British Summer Time (B. S. T.)	4½ hours slow on I. S. T.

In U. S. A. four standard times are used which are as follows;

Eastern U. S. A.	Eastern Time 10½ hours slow on I. S. T.
Central U. S. A.	Central Time 11½ hours slow on I. S. T.
Mountain States of U. S. A.	Mountain Tfme 12½ hours slow on I. S. T.
Western U. S. A.	Pacific Time 13½ hours slow on I. S. T.

Canada is similarly divided into five time-zones which are as follows;

East of 68° W	9½ hours slow on I. S. T
68° W—89° W	10½ hours slow on I. S. T.
89° W—103° W	11½ hours slow on I. S. T.
103° W—Rockies	12½ hours slow on I. S. T.
British Columbia	13½ hours slow on I. S. T.

In the Table that follows the relation of I.S.T. to time in different countries is given.

Time Difference in hours	Country
FAST ON I S.T.	
11½	Canada from 103° West to the Rockies; Mountain States of U S. A ; Mexico
10½	British Columbia; Western U. S. A.
8½	Yukon; Alaska
6	Newzealand
4½	Tasmania; Victoria; New South Wales; Queensland; New Guinea
4	South Australia, Northern Territory
3½	Japan: Korea
2½	East China, most of East Indies; Western Australia
1½	Indo-China; Siam; Straits Settlements
1	Burma
0	Ceylon
SLOW ON I. S. T.	
2½	Somaliland ; Iraq ; Tanganyika ; Kenya; Zanzibar
3	Uganda
3½	Finland; Estonia; Latvia; European Russia; Rumania: Bulgaria; Greece; Turkey; Syria; Palestine; Egypt; Sudan; Rhodesia; Union of S. Africa; Portuguese East Africa
4½	Norway; Sweden; Denmark; Germany; Poland Lithuania; Austria; Hungary; Switzerland; Italy; Czechoslovakia; Yugo-slavia; Albania; Tunis; Nigeria; French Equatorial Africa; Cameroons; Congo; Portuguese West Africa; Libya
5½	British Isles; France; Belgium; Spain;

Time Difference in hours	Countries
	Portugal; Algeria; Morocco; Gold Coast; Togo;
6½	Iceland; Senegal; French and Portuguese Guinea; Liberia; Sierra Leone
8½	Eastern Brazil
9	Uruguay
9½	Canada East of 68° West; Central Brazil; Argentina
10	Venezuela
10½	Canada from 68° W. to 89° W; Eastern U. S. A.; Western Brazil; Chile; Columbia
11½	Central Canada and U. S. A.; Part of Mexico; Central America

Call Signs.

For the purpose of indicating the nationality of a radio station the Telecommunications Convention has assigned the alphabet among the various nations. Every station chooses its call sign from the block of alphabets which have thus been assigned.

The Call Sign of an amateur station is composed of :—

1. One or two initial letters from the block assigned
2. A digit (which the local government allocates for the purpose of indicating the subdivision where the station is located), and
3. A few additional letters, to identify individual stations.

In the first column of the list that follows are given the assigned blocks from which the nationality of a station, be it an amateur or a broadcasting one, is at once established. The last column gives the amateur prefixes (No 1 above)

Block Assigned	Country	Amateur Prefix
CAA–CEZ	Chile	CE
CFA–CKZ	Canada	(VE)
CLA–CMZ	Cuba	CM (CO)*
CNA–CNZ	Morocco	CN
COA–COZ	Cuba	CO (CM)
CPA–CPZ	Bolivia	CP
CQA–CRZ	Protuguese Colonies :	
	Cape Verde Islands ...	CR 4
	Portuguese Guinea ...	CR 5
	Angola	CR 6

Block Assigned	Country	Amateur Prefix
	Mozambique ...	CR 7
	Portuguese India ...	CR 8
	Macao ...	CR 9
	Timor ...	CR 10
CSA-CUZ	Portugal	
	Portugal Proper ...	CT 1
	Azores Islands ...	CT 2
	Madeira Islands ...	CT 3
CVA-CXZ	Uruguay ...	CX
CYA-CZZ	Canada ...	(VE)
D	Germany ...	D
EAA-EHZ	Spain	
	Spain Proper ...	EA1-2-3-4-5-7
	Balearic Islands ...	EA6
	Canary Islands ...	EA8
	Spanish Morocco & North Africa ...	EA9
EIA-EIZ	Irish Free State ...	EI
ELA-ELZ	Liberia ...	EL
EPA-EQZ	Iran (Persia) ...	EP
ESA-ESZ	Estonia ...	ES
ETA-ETZ	Ethiopia (Abyssinia) ...	ET
F	France ...	
	France Proper ...	F3, F8
	Algéria ...	FA
	Madagascar ...	FB8
	French Togoland ...	FD8
	French Cameroons ...	FE8
	French West Africa ...	FF8
	Guadelope ...	FG8
	French Indo-China ...	FI8
	New Caledonia ...	FK8
	French Somaliland ...	FL8
	Martinique ...	FM8
	French India ...	FN8
	French Oceania ...	FO8
	Miquelon & St. Pierre Islands	FP8
	French Equatorial Africa ...	FQ8
	Reunion Islands ...	FR8
	Tunisia ...	FT4
	New Hebrides (French) ...	FU8
	French Guiana & Inini ...	FY8

Block Assigned	Country	Amateur Prefix
G	Unit d Kingdom	
	Great Britain except Ireland	
	Northern Ireland ...	G
HAA-HAZ	Hungary ...	GI
HBA-HBZ	Swiss Confederation ...	HAF
HCA-HCZ	Equador ...	HB
HHA-HHZ	Republic of Haiti ...	HC
HIA -HIZ	Dominican Republic ...	HH
HJA -HKZ	Republic of Colombia ...	HI
HPA -HPZ	Republic of Panama ...	HJ--HK
HRA -HRZ	Republic of Honduras ...	HP
HSA -HSZ	Siam ...	HR
HVA -HVZ	Vatican City	HS
HZA -HZZ	Hedjaz ...	
I	Italy and Colonies ...	HZ
J	Japanese Empire	I
	Japan ...	
	Chosen (Corea) ...	J1-J7
	Taiwan (Formosa) ...	J8
K	United States of America	J9
	Continental United States ...	
	Puerto Rico & Virgin Islands	(W)-(N)[1]
	Canal Zone ...	K4
	Territory of Hawaii, Guam,	K6
	U. S Samoa, Midway &	
	Wake Islands ...	
	Alaska ...	K6
	Phillipine Islands ...	K7
LAA-LNZ	Norway ...	K8
LOA-LWZ	Argentine Republic ...	LA
LXA-LXZ	Luxemburg ...	LU
LYA-LYZ	Lithuania ...	LX
LZA -LZZ	Bulgaria ...	LY
M	Great Britain ...	LZ
N	United States of America ...	G
OAA-OCZ	Peru ...	(K-W)(N)[1]
OEA-OEZ	Austria ...	OA
OFA-OHZ	Finland ...	OE
OKA-OKZ	Czechoslovakia ...	OH
ONA-OTZ	Belgium and Colonies ...	OK
OUA-OZZ	Denmark ...	ON

Block Assigned	Country	Amateur Prefix
	Denmark ...	OZ
	Faeroes ...	OY
	Greenland ...	OX
PAA-PIZ	Netherlands ...	PA
PJA -PJZ	Curacao ...	PJ
PKA -POZ	Netherlands Indies	
	Java ...	PK1--2--3
	Sumatra ...	PK4
	Dutch Borneo ...	PK5
	Celebes, Moluccas and New Guinea ...	PK6
PPA -PYZ	Brazil ...	PY
PZA -PZZ	Surinam ...	PZ
R	Union of Socialist Soviet Republics ...	(U)
SAA-SMZ	Sweden ...	SM
SOA-SRZ	Poland ...	SP
STA -SUZ	Egypt ...	
	Sudan ...	ST
	Egypt ...	SU
SVA-SZZ	Greece ...	SV
TAA-TCZ	Turkey ...	TA
TFA -TFZ	Iceland ...	TF
TGA-TGZ	Guatemala ...	TG
TIA -TIZ	Costa Rica ...	TI
TKA-TZZ	France & Colonies & Protectorates	(F)
U	Union of Socialist Soviet Republics :	
	European Soviet Republics (Russia)	U1-2-3-4-5-6
	Asiatic Soviet Republics (Siberia)	U 8-9-0
VAA-VGZ	Canada ...	VE
VHA-VMZ	Commonwealth of Australia	
	Australia ...	VK2-3-4-5-6-8
	Tasmania ...	VK7
	New Guinea ...	VK9
VOA-VOZ	Newfoundland ...	VO
VPA -VSZ	British Colonies & Protectorates :	
	British Honduras & Zanzibar	VP1
	Leeward Islands & Antigua ...	VP2

Block Assigned	Country	Amateur Prefix
	Gilbert & Ellice Islands & Ocean Island ...	VR1
	British Guiana ...	VP3
	Trinidad and Tobago ...	VP4
	Jamaica and Cayman Islands	VP5
	Barbados ...	VP6
	Bahamas ...	VP7
	Falkland Islands ...	VP8
	Bermuda ...	VP9
	Fanning Islands ...	VQ1
	Northern Rhodesia ...	VQ2
	Tanganyika ...	VQ3
	Kenya ...	VQ4
	Uganda ...	VQ5
	Mauritius and St Helena ...	VQ8
	Fiji Islands ...	VR-2
	Solomon Islands ...	VR4
	Straits Settlments ...	VS1
	Malaya ...	VS2-VS3
	North Borneo ...	VS4
	Sarawak ...	VS5
	Hong Kong ...	VS6
	Ceylon ...	VS7
	Bahrein Islands ...	VS8
	Maldive Islands ...	VS9
VTA-VWZ	British India ..	VU
VXA-VYZ	Canada ...	(VE)
W	United States of America ...	(K) (N) W
XAA-XFZ	Mexico ...	XE
XGA-XUZ	China ...	XT-XU
XYA-XZZ	British India ...	(VU)
YAA-YAZ	Afghanistan ...	YA
YBA-YHZ	Netherlands Indies ...	(PK)
YIA -YIZ	Iraq ...	YI
YJA -YJZ	New Hebrides ...	YJ
YLA -YLZ	Latvia ...	YL
YMA-YMZ	Free City of Danzig ...	YM
YNA-YNZ	Nicaragua ...	YN
YOA-YRZ	Rumania ...	YR
YSA -YSZ	Republic of El Salvador ...	YS
YTA-YUZ	Yugo-Slavia ...	YT-YU

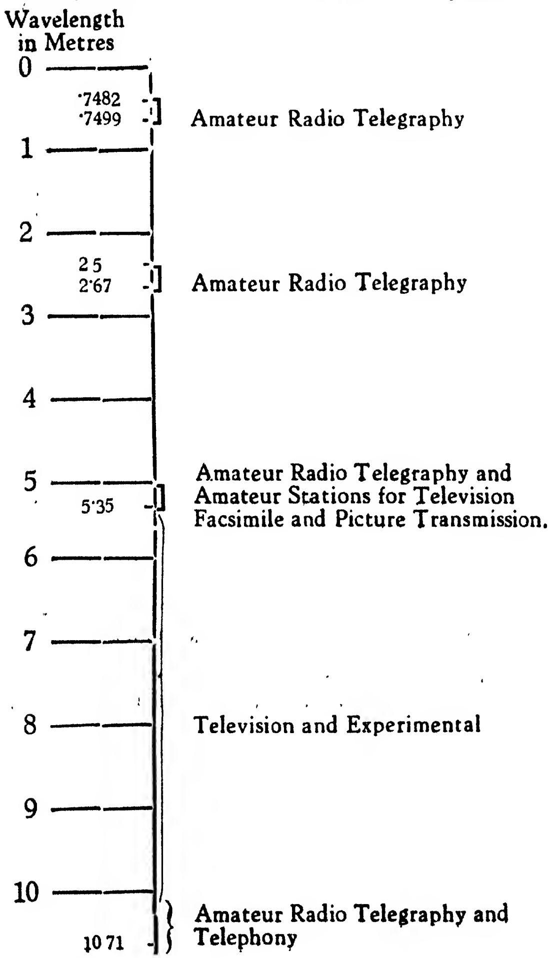
Block Assigned	Country	Amateur Prefix
YVA-YWZ	Venezuela ...	YV
ZAA--ZAZ	Albania ...	ZA
ZBA -ZJZ	British Colonies & Protectorates :	
	Malta ...	ZB1
	Gibralter ...	ZB2
	Transjordania ...	ZC1
	Cocos Islands ...	ZC2
	Christmas Islands ..	ZC3
	Cyprus ...	ZC4
	Palestine ..	ZC6
	Sierra Leone ..	ZD1
	Nigeria & British Cameroons	ZD2
	Gambia ...	ZD3
	Gold Coast ...	ZD4
	Nyassa ...	ZD6
	Ascencion ...	ZD8
	Southern Rodesia ...	ZE
ZKA-ZMZ	Newzealand	
	Cook Island ...	ZK1
	Niue ...	ZK2
	New Zealand .	ZL
	British Samoa ...	ZM
ZPA -ZPZ	Paraguay ...	ZP
ZSA -ZUZ	Union of south Africa ...	ZS-ZT-ZU
ZVA--ZZZ	Brazil ...	(PY)

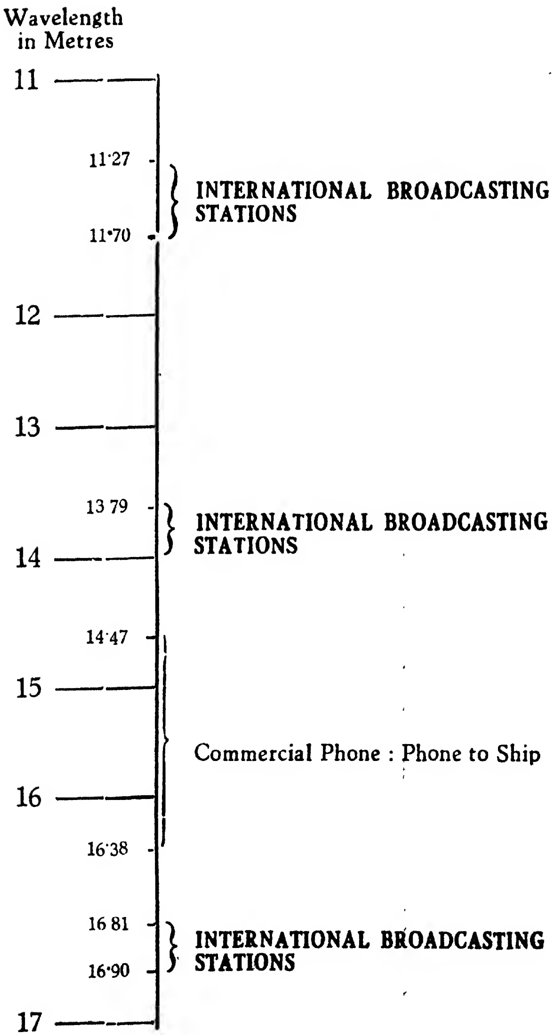
* CM is used by C. W. Stations ; CO by phones

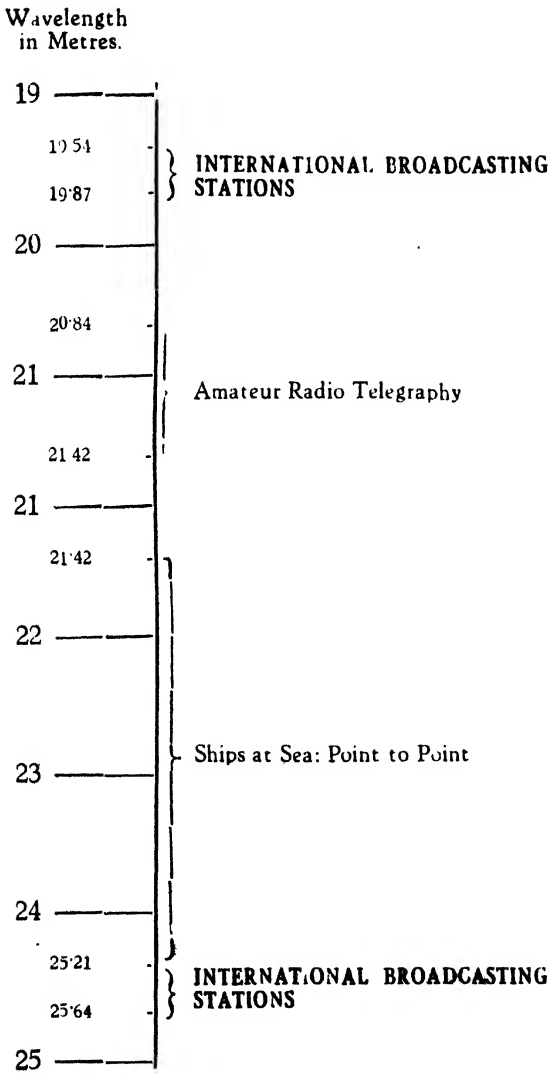
[1] Certain amateur stations licensed to members of the U S. Naval Communications Reserve are authorized to use the prefix N.

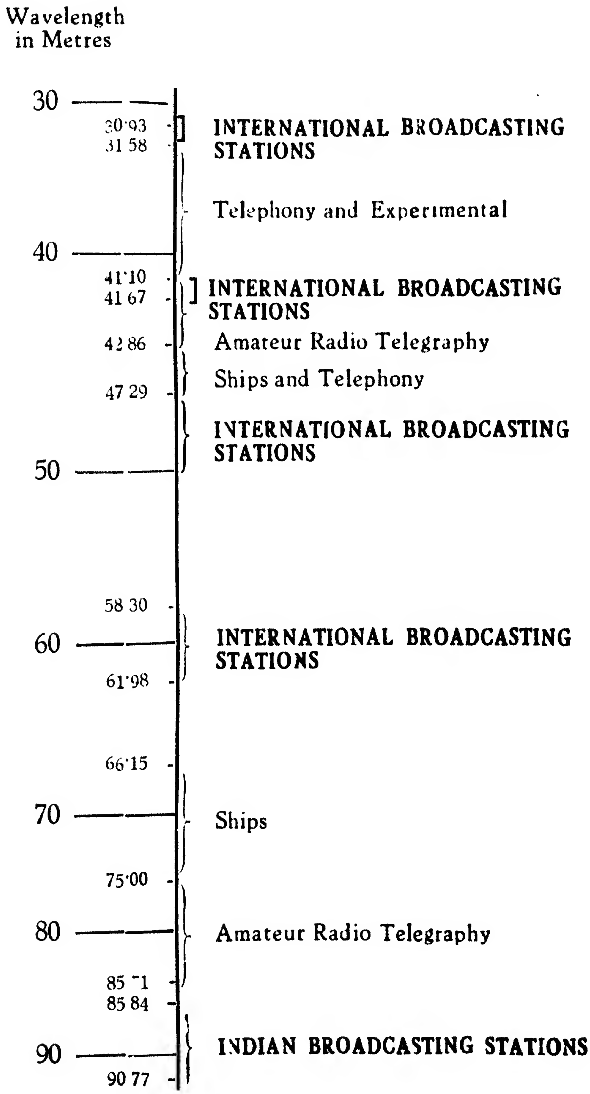
Assignment of Transmission Bands

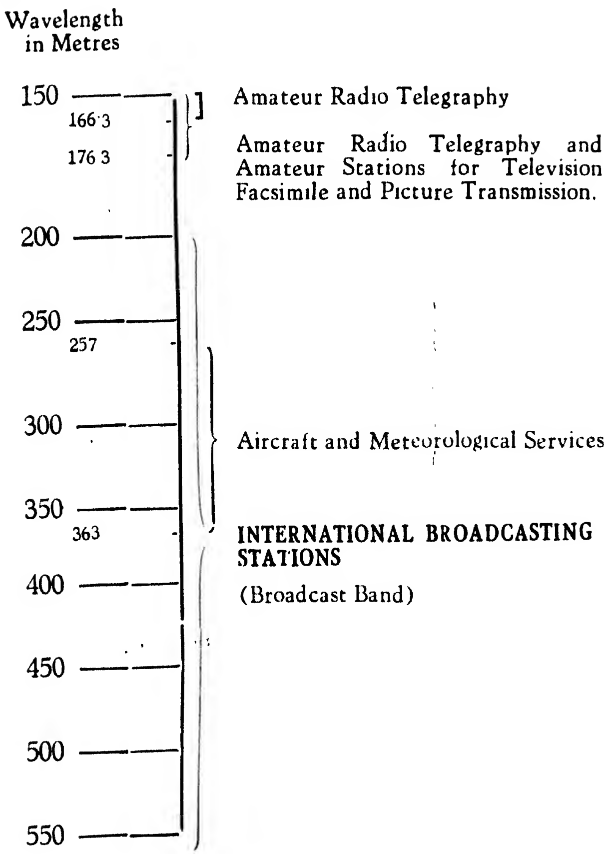
Ultra short waves	from	1 Metre	to	10 Metres.
Short waves	from	10 Metres	to	100 Metres.
Medium waves	from	100 Metres	to	1000 Metres.
Long waves	from	1000 Metres upwards.		




Wavelength in Metres
11
11·27
INTERNATIONAL BROADCASTING STATIONS
11·70
12
13
13·79
INTERNATIONAL BROADCASTING STATIONS
14
14·47
15
Commercial Phone : Phone to Ship
16
16·38
16·81
INTERNATIONAL BROADCASTING STATIONS
16·90
17


Wavelength in Metres.
19
19·54
19·87
INTERNATIONAL BROADCASTING STATIONS
20
20·84
21
Amateur Radio Telegraphy
21·42
21
21·42
22
23
Ships at Sea: Point to Point
24
25·21
25·64
INTERNATIONAL BROADCASTING STATIONS
25


Wavelength
in Metres
30
30·93
31·58
INTERNATIONAL BROADCASTING STATIONS
Telephony and Experimental
40
41·10
41·67
INTERNATIONAL BROADCASTING STATIONS
42·86
Amateur Radio Telegraphy
Ships and Telephony
47·29
INTERNATIONAL BROADCASTING STATIONS
50
58·30
60
INTERNATIONAL BROADCASTING STATIONS
61·98
66·15
70
Ships
75·00
80
Amateur Radio Telegraphy
85·71
85·84
90
INDIAN BROADCASTING STATIONS
90·77


Wavelength in Metres
150
166·3
176·3
200
250
257
300
350
363
400
450
500
550
Amateur Radio Telegraphy
Amateur Radio Telegraphy and Amateur Stations for Television Facsimile and Picture Transmission.
Aircraft and Meteorological Services
INTERNATIONAL BROADCASTING STATIONS
(Broadcast Band)

Wavelength and Frequency

Frequency in Kc/s	Wave length in Metres	Frequency in Kc/s	Wave lenth in Metres	Frequency in Kc/s	Wave length in Metres
300,000	1	8,108	37	1,429	210
150,000	2	7,895	38	1,364	220
100,000	3	7,692	39	1,304	230
75,000	4	7,500	40	1 250	240
60,000	5	7,317	41	1,200	250
50,000	6	7,143	42	1,154	260
42,855	7	6 977	43	1,111	270
37,500	8	6,818	44	1 071	280
33,333	9	6,667	45	1,034	290
30,000	10	6,522	46	1,000	300
27 273	11	6,383	47	967 7	310
25,000	12	6,250	48	937·5	320
23,077	13	6,122	49	909·1	330
21,429	14	6,000	50	882 3	340
20,000	15	5,454	55	857 1	350
18,750	16	5,000	60	833 3	360
17,647	17	4,615	65	810·8	370
16,666	18	4,286	70	789·5	380
15,789	19	4,000	75	769 2	390
15,000	20	3,750	80	750·0	400
14,285	21	3,529	85	731 7	410
13,636	22	3,333	90	714·3	420
13 043	23	3,158	95	697 7	430
12,500	24	3,000	100	681 8	440
12,000	25	2,857	105	666·7	450
11,538	26	2,727	110	652 2	460
11 111	27	2,609	115	638 3	470
10,714	28	2,500	120	625 0	480
10,346	29	2,308	130	612 2	490
10,000	30	2,143	140	600·0	500
9,677	31	2,000	150	588 2	510
9,375	32	1,875	160	576·9	520
9,091	33	1,765	170	566 0	530
8,823	34	1,667	180	555 6	540
8,571	35	1,579	190	545·4	550
8,333	36	1,500	200	535·7	560

Frequency in Kc/s	Wave length in Metres	Frequency in Kc/s	Wave length in Metres	Frequency in Kc/s	Wave length in Metres
526·3	570	230·8	1,300	142 9	2,100
517 1	580	222 2	1 350	136·4	2.200
508 5	590	214 3	1 400	130·4	2,300
500 0	600	212 8	1,410	125 0	2.400
461·5	650	206·9	1,450	120 0	2,500
428·6	700	202·7	1 480	115 4	2.600
400 0	750	200·0	1 500	111 1	2,700
375 0	800	193 5	1,550	107 1	2 800
352 0	850	187·5	1.600	103·4	2,900
333 3	900	181·8	1,650	100 0	3 000
315 8	950	176·5	1.700	96·77	3,100
300·0	1,000	172 4	1,740	93·75	3,200
285 7	1,050	171·4	1,750	90 91	3,300
272 7	1.100	166 7	1,800	88 24	3,400
260 9	1,150	162·2	1,850	85·71	3,500
250·0	1,200	157 9	1,900	80 00	3,750
241·9	1,240	153 8	1,950	78 95	3,800
240 0	1.250	151 5	1,980	76·92	3,900
232·6	1,290	150 5	2 000	75 00	4,000

Broadcasting Stations in India

In the following list all stations except the last four are under the All India Radio. The programmes of these stations are published fortnightly in five journals, viz. The Indian Listener (English), Sarang (Hindi) Awaz (Urdu), Betar Jagat (Bengali), and Vanoli (Tamil).

The Allahabad Radio station is operated by the Allahabad Agricultural Institute. Transmissions normally begin at 6 30 p. m. in summer and at 6 p. m. in winter lasting usually about an hour and a half. Programmes are published in the Leader, Allahabad.

The Hyderabad and Aurangabad broadcasting stations are operated by H E H. the Nizam's State Broadcasting Service. The Haderabad station begins transmissions at 5 30 p. m. and closes down at 10 p. m. Programmes are published fortnightly by the Broadcasting Authorities.

STATION			Power in k. W.	Call Sign	Frequeny in kc/s.	Wave-length in Metres.	Transmission Time (I. S. T.)
1.	Delhi	M. W.	20	VUD	886	338.6	i 7.30 a. m. ... 10.00 a. m.
					,,	,,	ii 12 00 noon ... 2 00 p m.
					,,	,,	iii 5 00 p. m. ... 10 45 p. m
	Delhi	S W.	10	VUD2	7.290	41.15	i 7.30 a. m. ... 10.00 a m.
					9 590	31.3	ii 12.00 noon ... 2.00 p. m
					7,290	41.15	iii (a) 5.00 p. m. ... 7.00 p. m.
					4,960	60.48	iii (b) 7.15 p. m. ... 10 45 p. m.
	Delhi	S. W.	5	VUD3	15,290	19.62	i 7.35 a. m. ... 10 30 a. m.
					15,290	19.62	ii 11 30 a. m. ... 2 55 p m.
					9,590	31-3	iii (a) 5.00 p. m. ... 9 30 p m.
					6,085	49.3	iii (b)9.50 p. m. ... 10 20 p. m.
	Delhi	S. W.	10	VUD4	11,830	25.36	i 7 30 a. m ... 10.00 a. m.
					,,	,,	ii 12.00 noon ... 2 00 p. m.
					,,	,,	iii 5.00 p m. ... 10.45 p. m.
2.	Bombay	M. W.	15	VUB	1,231	244	i 7.30 a m. ... 9.30 a. m.
					,,	,,	ii 12 30 p. m. ... 2.25 p. m.
					,,	,,	iii 5 00 p. m. ... 10.45 p. m.

STATION	Power in k. W.	Call Sign	Frequency in kc/s.	Wave-length in Metres.	Transmission Time (I. S. T.)
Bombay S W.	10	VUB2	7,240	41.44	i 7.30 a. m. ... 9.30 a. m.
			9,550	31.4	ii 12 30 p. m. ... 2.25 p. m.
			7.240	41 44	iii (a) 5 00 p. m. ... 7.15 p. m.
			4 880	61.48	iii (b) 7.50 p m ... 10.45 p. m.
3 Madras M.W.	0 25	VUM	1 420	211	i 7 30 a. m. ... 9 00 a. m.
			,,	,,	ii 1 30 p. m. ... 3 00 p. m.
			,,	,,	iii 4 00 p. m. ... 10.30 p. m.
Madras S. W.	10	VUM2	7,270	41 27	i 7 30 a. m. ... 9.00 a. m.
			9 570	31.35	ii 1 30 p. m ... 3 00 p m.
			7,270	41.27	iii (a) 4 00 p. m. ... 5 45 p. m.
			4,920	60 98	iii (b) 6.00 p. m, ... 10.30 p. m.
4. Calcutta M W.	1.5	VUC	810	370.4	i 7.30 a. m. ... 9 00 a. m.
			,,	,,	ii 12 30 p. m. ... 3 00 p. m.
			,,	,,	iii 5.00 p. m. ... 10.30 p. m.
Calcutta S. W.	10	VUC2	7,210	41 61	i 7 30 a. m. ... 9.00 a. m.
			9,530	31.48	ii 12.30 p. m. ... 3 00 p m.
			7 210	41.61	iii (a) 5 00 p. m. ... 8.45 p. m.
			4,840	61.98	iii (b) 9 00 p. m. ... 10.30 p m.

STATION	Power in k. W.	Call Sign.	Frequency	Wave-length in Metres.	Transmission Time (. S. T.)
5 Lahore M. W.	5	VUL	1,086	276	i 7 30 a. m. ... 9 30 a. m.
			,,	,,	ii 12 30 p. m ... 1.35 p m
			,,	,,	iii 5.30 p m. ... 10.45 p. m.
6. Lucknow M. W.	5	VUW	1,022	293 5	i 7.30 a. m. ... 9 30 a. m.
			,,	,,	ii 12.30 p. m. ... 1 35 p. m.
			,,	,,	iii 5 30 p m. ... 10 45 p. m.
7. Trichinopoly, M. W.	5	VUT	758	396	i 7 30 a. m. ... 9.00 a. m.
			,,	,,	ii 1.00 p. m. ... 2 30 p. m.
			,,	,,	iii 5 00 p. m. ... 10.00 p. m.
8. Dacca M. W.	5	VUY	1,167	257.1	5.00 p. m. ... 10.30 p. m.
9. Peshawar M.W.	0.25	VUP	1,500	200	i 8 30 a m. ... 9.30 a. m.
			,,	,,	ii 5 00 p. m ... 10.45 p. m.
10. Allahabad M. W.		VUA	1 465	203 5	Summer: 6 30 p m ... 8 00 p. m.
			,,	,,	Winter: 6 00 p.m. ... 7 30 p.m.
11. Hyderabad M.W	5	VUV	730	411 0	Summer and Winter : 5.30 p m. ... 10.00 p m.
12. Aurangabad M.W	·5	VUX	940	319.1	5. 30 p. m. ... 9 30 p m.
13. Mysore (Akash-Vani) M W.	·3	VU7MC	968	310.0	5 00 p. m. ... 9.00 p. m.

The transmission timings and wavelengths of the first nine stations belonging to the All India Radio, will be effective during the summer of 1941 i. e. from April 16 to October 16 During 1941 winter i. e. from October 16 the following wavelengths will be in use :

Station	Frequency in kc/s.	Wavelength in Metres.	Transmission
Delhi VUD 2	4,960 3,495	60,48 85.84	iii (a) Evening iii (b) Late Evening
Bombay VUB 2	4,880 3,365	61 48 89.15	iii (a) Evening iii (b) Late Evening
Madras VUM 2	4,920 3 435	60 98 87.34	iii (a) Evening iii (b) Late Evening
Calcutta VUC 2	4,840 3,305	61.98 90 77	iii (a) Evening iii (b) Late Evening

From May 16, 1941 the above stations will adopt the 41 metre band for the midday transmissions.

British Oversea Services (B. B. C.)

Call Signs	Wavelength in Metres	Frequency in Mc/s	'On' Between	Best reception between
			Special Indian Transmission (Directed to India)	
GSG	16.86	17.79	7.30 p. m. & 8.30 p. m.	7.30 p. m. & 8 30 p. m.
GSP	19.60	15.31	7.30 p. m & 8.30 p. m.	7.30 p. m. & 8.30 p. m.
			Eastern Transmission (Directed to India)	
GSV	16.84	17.81	4.25 p. m. & 8.30 p. m.	4,25 p. m. & 8.30 p. m.
GSF	19 82	15 14	4.25 p. m. & 10.00 p. m.	4 25 p. m. & 10 00 p. m.
GSD	25 53	11.75	7.30 p. m. & 10.00 p. m.	8.30 p. m. & 10 00 p. m.
			(Interval from 7.00 p m. to 7.15 p m.)	
			Part of African Transmission (Directed to India)	
GRV	24.92	12.04	10·25 p. m. & 11·45 p. m.	10.25 p. m. & 11.45 p m.
			North American Transmission (Not directed to India)	
GSD	25.53	11.75	3.50 a. m. & 6.45 a. m	8.30 a. m & 10.15 a. m.
			8.00 a. m. & 10.15 a m.	
GRY	31.25	9.60	3 50 a. m. & 10.15 a. m.	Not satisfactory
GSC	31.32	9.58	3.50 a. m. & 10 15 a. m.	Not satisfactory
GSL	49.10	6.11	7.00 a. m. & 10.15 a. m.	7.00 a. m. & 8.30 a. m.

Call sign	Wavelength in Metres	Frequency in Mc/s	'On' Between	Best reception between
Pacific Transmission (Not directed to India)				
GSV	16.84	17.81	1.00 p m. & 3.30 p. m.	2.00 p m & 3.30 p m.
GSP	19.60	15.31	1.00 p. m. & 3 30 p m	1 00 p. m. & 3 30 p. m
GSI	19.66	15.26	11.40 a m & 3.30 p m.	Not satisfactory
GSF	19.82	15.14	1.00 p. m. & 3.30 p m	1.00 p m & 3 30 p m.
GSD	25.53	11.75	11.40 a. m. & 3 30 p. m.	11 40 a. m & 1 00 p m
GSB	31 55	9 51	11 40 a m. & 3 30 p. m	11.40 a. m & 12 noon

Time Schedule

OF

SOME SHORT WAVE BROADCASTING STATIONS.

Station	Call Sign	Wave-length in Metres	Frequency in Mc/s.	Time		(I S T)
New York	W 2 XE	13 91	21.57	6.00 p. m.	—	11. p. m.
Boston	WIXAL	13.98	21 46	9 30 p. m	—	10. p. m.
Java	PMA	15.48	19 38	5 45 p. m.	—	
Bangkok	HS 8 PJ	15 77	19.02	6.30 p. m.	—	8 30 p. m.
				5 45 p. m.	—	7,15 p m.
New York	W 3 XL	16 87	17.78	5 30 a. m	—	9 30 a. m.
				7 30 p m.	—	5.30 a. m.
Budapest	HAS 3	19 52	15.37	10 25 a. m.	—	1.45 p. m
				7.30 p m.	—	8.30 p. m
Buneos Aires	LRU	19 62	15.29	5 30 a. m.	—	7 30 a. m.
New York		19.65	15 27	11.30 p. m.	—	1 30 a, m,
Boston	WIXAL	19 67	15 25	1.30 a. m.	—	2 30 a. m.
Ankara	TAP	19.74	15.19	4 00 p. m.	—	6.00 p. m,
Stockholm	SM 5 SX	19.79	15 16	5.30 p. m.	—	3.30 a. m
Bandoeng		19 80	15 15	11 15 a. m.	—	12.30 p: m
				3 00 p m	—	10.00 p. m.
Boston		19.83	15.13	8 30 p. m.	—	10 00 p. m

Station	Call Sign	Wave-length in Metres	Fre-quency in Mc/s	Time		(I. S. T.)
Rio de Janeiro	PSE	20 09	14 94	1 30 a m.	—	2.45 a. m.
Radio Nations	HI	20 64	14.54	11 45 p. m.	—	12 45 a m.
China	XTOY	25.21	11 90	5 30 a m.	—	3 30 p. m
				7 30 p m.	—	12 30 a. m.
Melbourne		25.25	11 88	10 30 a. m.	—	1.30 p. m
				1.30 a. m.	—	4 30 a. m
New York		25 36	11.83	1 30 a. m.	—	4,00 a. m.
				4 45 a. m.	—	9 30 a. m.
Boston	WIXAL	25 45	11 79	11.30 p. m.	—	5 00 a. m
Saigon		25.46	11.78	4 30 p. m.	—	5 45 p. m (in English)
Panama	HP 5 G	25 47	11.78	4 00 a m	—	8 30 a m
Lahti		25 47	11 78	11 45 a m.	—	10.45 p m.
Boston	WIXAL	25.58	11 73	7 45 a. m.	—	9 30 a. m
Panama	HP 5 A	25 64	11 70	4 30 a. m.	—	9 00 a m
Singapore	ZHP	30.96	9 69	3,10 p. m.	—	8.10 p m.
				11 10 a. m.	—	12.10 p m. (Wed.)
				10.55 a. m.	—	12.10 p m. (Sat)
				9 10 a. m.	—	19.40 a. m. (Sun.)
Kliphenvel (South Africa)		31.23	9.60	2 00 p. m.	—	3 00 p. m.
				4 00 p. m.	—	5 30 p. m,
				7.30 p. m.	—	10 15 p. m
				10.15 a. m.	—	11 20 a. m.
Perth	VK 6 ME	31.28	9.59	4 30 p. m.	—	6.30 p m. (Ex Sun.)

Stations	Call Sign	Wave-length in Metres	Frequency in Mc/s.	Time		(I S T.)
Sydney	VK 2 ME	31 28	9 59	11 30 a. m.	—	1.30 p. m. (Sun)
				3 30 p. m.	—	9 30 p m (Sun)
Melbourne	VLR	31.32	9 58	2 20 p m.	—	6 00 p. m (Sun)
				4 00 p m.	—	7 00 p m. (Ex. Sun)
Schenectady	W 2 XAD	31.41	9.55	4 45 a. m.	—	8 30 a m.
Bandoeng	YDB	31.41	9 55	4.30 a m.	—	6.00 a. m
				3 00 p m.	—	9.00 p. m.
Robert's Heights (South Africa)	ZRH	31.50	9 52	4 00 p. m.	—	5 30 p m. (Sun)
				3 30 p, m.	—	6 00 p. m (Ex Sun)
Bangkok	HS 8 PJ	31.55	9 51	6.30 p. m.	—	8 30 p. m (Thu)
Ankara	TAP	31 70	9.46	10 00 p m.	—	2.30 a m. (Sat)
Colombo	VPB	48 70 428.00	6.16 } .70 }	6 00 p. m.	—	
Kliphenvel (South Africa)	ZRK	49 20	6 10	10.30 p. m.	—	1 30 a. m. (Sun)
				10 30 p. m.	—	2.30 a. m. (Ex. Sun)
Rangoon	XYO	49.94	6.01	7 30 a m.	—	9 30 a. m.
				5 30 p m.	—	8 30 p m
Robert's Heights (South Africa)	ZRH	49 94	6.01	7 30 p. m.	—	10 30 p. m.
				10.45 p. m.	—	1.45 a. m.
				10 15 a. m.	—	11 20 a. m.
Durban	ZRD	61.53	4.88	6 00 p m.	—	10 30 p. m.

Except where stated otherwise the above transmissions take place daily

Short Wave Broadcasting Stations

Station	Country	Call Sign	Frequency in Mc/s	Wave-length in Metres	Power in kw
49-Metre Band (9.000—6 200 Mc/s)					
Rangoon	Burma	XYO	6.007	49.94	
Pretoria	South Africa	ZRH	6,007	49.94	5
Pernambuco	Brazil	PRA8	6.010	49.92	—
Boston	U. S. A.	WRUL	6.040	49.67	20
British Oversea Service		GSA	6.050	49.59	10–50
Philadelphia	U. S. A.	WCAB	6.060	49.50	10
Motala	Sweden	SBO	6.065	49.46	12
Toronto	Canada	CFRX	6.070	49.42	—
Lima	Peru	OAX4Z	6.080	49.34	15
Vancouver	Canada	CFKX	6.080	49.34	—
Nairobi	Kenya	VQ7LO	6.083	49.31	1
Toronto	Canada	CRCX	6.090	49.26	—
Cape Town	South Africa	ZRK	6.097	49.20	5
Belgrade	Yugoslavia	YUA	6.100	49.18	10
British Oversea Service		GSL	6.110	49.10	10–50
Saigon	French Indo-China	FZR	6.110	49.10	12
Lahti	Finland	OFD	6.120	49.02	1
Hsinking	Manchukuo	MTCY	6.125	48.98	20
Pittsburgh	U. S. A.	WPIT	6.140	48.86	40

Stations	Country	Call Sign	Frequency in Mc/s	Wave-length in Metres	Power in kw
British Oversea Service		GRW	6 145	48.82	10–50
Winnipeg	Canada	CJRO	6.150	48 78	2
Teheran	Iran	EQB	6.155	48 74	14
Colombo	Ceylon	—	6 160	48.73	
Schwarzenburg	Switzerland		6.165	48.66	25
Lima	Peru	OAX4G	6.180	48 54	15
Schenectady	U. S. A.	WGEA/O	6.190	48 47	25-100
Vatican City		HVJ	6 190	48 47	25
Athlone	Ireland	—	6 190	48.47	—
Ica'	Peru	OAXIA	6 335	47 33	—
Radio Nations	Switzerland	HBQ	6.675	44.94	20
Bandoeng	Dutch East Indies	PMH	6 720	44.64	1 5
Valladolid	Spain	FETI	7 070	42 43	—
Ireland					
41-Metre Band (7 200–7 300Mc/s)					
British Oversea Service		GSW	7.230	41 49	10–50
Tokio	Japan	JVW	7 257	41 34	50
British Oversea Service		GSU	7 260	41 32	10–50
Lisbon	Portugal	CSW8	7 260	41 32	10
Moscow	U. S. S. R.		7 545	39 76	20–100
Cairo	Egypt	SUX	7 865	38 14	10
Moscow	U. S. S R	—	9.010	33 30	20–100
Budapest	Hungary	HAT4	9 125	32.88	5

Station	Country	Call Sign	Frequency in Mc/s	Wave-length	Power in kw
Bucharest	Rumania	—	9.280	32.33	—
Lima	Peru	OAX4J	9.340	32.12	—
Radio Nations	Switzerland	HBL	9.345	32.10	20
Ankara	Turkey	TAP	9.465	31.70	20
St. John's	Newfoundland	VONG	9 482	31.64	—
31–Metre Band (9.500–9.700 Mc/s)					
Chungking	China	XGOY	9 500	31.58	35
Bangkok	Thailand	HS8PJ	9.500	31.58	10
Lahti	Finland	OFD	9.500	31.58	1
Mexico City	Mexico	XEWW	9.503	31.57	10
Belgrade	Yugoslavia	YUC	9.505	31 56	10
British Oversea Service		GSB	9.510	31.55	10–50
Moscow	U. S. S. R.	RW96	9.520	31.51	20–100
Pretoria	South Africa	ZRG	9.523	31.50	5
Hong Kong	China	ZBW3	9.525	31.49	2 5
Schenectady	U. S. A.	WGEO	9.530	31.48	100
Treasure Island	U. S. A.	KGET	9.530	31.48	20
Tokio	Japan	JZI	9.535	31 46	50
Motala	Sweden	SBU	9.535	31.46	12
Suva	Fiji	VPD2	9.535	31.46	—

Station	Country	Call Sign	Frequency in Mc/s	Wave-length in Metres	Power in kw
Vatican City		HVJ	9.550	31.41	25
Pittsburgh	U. S. A	WPIT	9.570	31.35	40
Millis	U. S. A	WBOS	9.570	31.35	10
Montevedio	Uruguay	CXA2	9.570	31.35	5
British Oversea Service		GSC	9.580	31.32	10-50
Melbourne	Australia	VLR	9.580	31.32	2
Philadelphia	U. S. A.	WCAB	9.590	31.28	10
British Oversea Service		GRY	9.600	31.25	10-50
Moscow	U. S S. R.	RAL	9.600	31.25	20-100
Cape Town	South Africa	ZRL	9.606	31.23	5
Panama City		HP5J	9.610	31.32	2.5
Sydney	Australia	VLQ	9.615	31.20	—
Budapest	Hungary	HAT5	9.625	31.17	5
Taihoku	Formosa	JFO	9.636	31.13	—
Wayne	U. S. A	WCBX	9.650	31.09	10
Perth	Ausralia	VLW2	9.650	31.09	—
Perth	Australia	VLW4	9.655	31.04	—
Vatican City		HVJ	9.660	31.06	25
Buenos Aires	Argentine	LRX	9.660	31.06	7
Manila	Philippine Islands	KZRH	9.660	31.06	—
Treasure Island	U. S. A.	KGEI	9.670	31.02	20
Teheran	Iran	EQC	9.680	30.99	14
Mexico City	Mexico	XEQQ	9.680	30.99	10
Sydney	Australia	VLQ5	9.680	30.99	—

Station	Country	Call Sign	Frequency in Mc/s	Wave-length in Metres	Power
British Oversea Service		GRX	9.690	30.96	10–50
Buenos Aires	Argentine	LRA1	9.690	30.96	10
Singapore	Malaya	ZHP	9.700	30 93	2.5
Fort-de-France	F. W. I		9.705	30.92	—
Lisbon	Portugal	CSW7	9.740	30 80	10
Athens	Greece	SVJ	9.825	30.54	—
Madrid	Spain	EAJ7	9.860	30.43	10
Rio de Janeiro	Brazil	PSH	10.220	29.35	—
Bandoeng	Java	PMN	10.260	29.24	1 5
Sofia	Bulgaria		10.310	29.10	—
Buenos Aires	Argentine	LSX	10.350	28.99	12
Moscow	U. S. S. R.		10.724	29.59	20–100
Lisbon	Portugal	CSW6	11 040	27.17	10
Radio Nations	Switzerland	HBO	11.402	26.31	20
Moscow	U. S. S. R.		11.500	26.09	20–100
Canton	China	XGOK	11.650	25.75	—
25—Metre Band (11.700–11.900 Mc/s)					
Motala	Sweden	SBP	11.705	25.63	12
Panama City		HP5A	11.700	25 64	2.5
Moscow	U. S. S. R.		11.710	25 62	20–100
Bangkok	Thailand	HSP6	11 715	25 61	10
Winnipeg	Canada	CJRX	11.720	25 60	2

Station	Country	Call Sign	Frequency in Mc/s	Wave-length in Mettes	Power
Buenos Aires	Argentine	LRA3	11.730	25 58	10
Vatican City		HVJ	11.740	25.55	25
British Oversea Service		GSD	11 750	25.53	10–50
Moscow	U. S. S. R.	RNE	11.766	25 51	20–100
Hsinking	Manchukuo	MTCY	11 775	25 48	20
Saigon	Grench Indo-China	FZR	11 780	25,47	12
Lahti	Finland	OFE	11.780	25 47	1
Boston	U. S. A.	WRUL	11.790	25 45	20
Tokio	Japan	JZJ	11.800	25.42	50
British Oversea Service		GSN	11 820	25 38	10–50
Moscow	U. S. S. R.		11.830	25.36	20–100
Wayne	U. S. A.	WCBX	11.830	25 36	10
Perth	Australia	VLW3	11.830	25.36	—
Lisbon	Portugal	CSW5	11.840	25 34	10
Melbourne	Australia	VLR3	11.850	25.32	2
Rio de Janeiro	Brazil	PRF5	11.855	25 30	—
British Oversea Service		GSE	11 860	25.29	10–50
Sydney	Australia	VLQ2	11.870	25 27	—
Pittsburgh	U. S. A.	WPIT	11.876	25.26	40
Sydney	Australia	VLQ7	11 880	25.25	—
Chungking	China	XGOY	11.900	25.21	35
Moscow	U. S S. R.		11 910	25.19	20–100
Rabat	Morocco		11 940	25.13	—
Moscow	U S. S. R.	RNE	12.000	25.00	20–100

Station	Country	Call Sign	Frequency in Mc/s	Wave-length in Metres	Power in kw
Shanghai	China	FFZ	12 050	24.90	—
Quito	Ecuador	HCJB	12.460	24 08	—
Moscow	U S. S. R.	RKI	14.717	20 38	20–100
Radio Nations	Switzerland	HBJ	14.538	20 61	20
19–Metre Band 15.000–15.350 Mc/s)					
Moscow	U. S. S. R	RKI	15 040	19 95	20–100
Tehran	Iran	EBP	15.100	19.87	14
Vatican City		HVJ	15.120	19 84	25
Boston	U. S. A.	WRUL	15.130	19.83	20
British Oversea Service		GSF	15 140	19 82	10–50
Bandoeng	Netherland Indies		15 150	19.80	
Motala	Sweden	SBT	15.155	19 80	12
Tokio	Japan	JZK	15.160	19.79	50
Moscow	U S. S. R.	RW96	15.180	19.76	20–100
British Oversea Service		GSO	15.180	19.76	10–50
Lahti	Finland	OIE	15.190	19.75	1
Ankara	Turkey	TAQ	15.195	19.74	20
Chungking	China	XGOX	15 200	19.74	35
Pittsburgh	U. S. A.	WPIT	15 210	19.72	40
Lisbon	Portugal	CSW4	15 215	19.72	10
Belgrade	Yugoslavia	YUG	15.240	19 68	10
Boston	U. S. A	WRUL	15 250	19 67	20

Station	Country	Call Sign	Frequency in Mc/s.	Wave-length in Metres	Power in kw
British Oversea Service		GSI	15 260	19.66	10–50
Wayne	U. S. A	WCBX	15.270	19.65	10
Buenos Aires	Argentine	LRU	15 290	19 62	7
British Oversea Service		GSP	15.310	19.60	10–50
Sydney	Australia	VLQ3	15.315	19 59	—
Schenectady	U. S. A.	WGEA/O	15 330	19 57	25–100
Treasure Island	U. S. A.	KGEI	15.330	19 57	20
Budapest	Hungary	HAS3	15 370	19 52	5
Moscow	U S. S. R.		15.715	19.09	20–100
16-Metre Band(17.750–17.850 Mc/s)					
Pittsburgh	U. S A.	WPIT	17.780	16,87	40
Bound Brook	U. S. A.	WNBI	17.780	16.87	25
British Oversea Service		GSG	17.790	16.86	10–50
Chungking	China	XGOX	17 800	16.85	35
Sydney	Australia	VLQ8	17.800	16.85	—
British Oversea Service		GSV	17.810	16.84	10–50
Wayne	U. S. A.	WCBX	17 830	16 83	10
Tokio	Japan	JLS2	17 845	16.81	50
Moscow	U. S. S R.		17.910	16 75	20–100
Radio Nations	Switzerland	HBF	18 450	16.26	20
Moscow	U. S. S. R.		18.540	16.18	20–100
Bangkok	Thailand	HS6PJ	19 020	15 77	10

Station	Country	Call Sign	Frequency in Mc/s	Wave-length in Metres	Power in kw
(13-Metre Band 21,450-21 750 Mc/s)					
Boston	U. S. A.	WRUL	21.460	14.00	20
British Oversea Service		GSH	21.470	13.97	10-50
Schenectady	U. S. A.	WGEA	21.500	13.95	25
Philadelphia	U. S. A.	WCAB	21.520	13.94	10
British Oversea Service		GSJ	21.530	13.93	10-50
Pittsburgh	U. S. A.	WPIT	21.540	13,93	40
British Oversea Service		GST	21.550	13.92	10-50
Wayne	U. S. A.	WCBX	21.570	13.91	10
Schenectady	U. S. A.	WGEA/O	21.590	13.89	25-100
British Oversea Service		GRZ	21.640	13 86	10-50
(11-Metre Band 25,600-26 600 Mc/s)					
Boston	U. S. A.	WRUW	25.600	11.70	—
St. Louis	U. S A.	W9XPD	25.900	11.58	—
Cincinnati	U. S. A.	W8XNU	25.950	11.56	—
South Band	U. S. A.	W9XH	26 050	11.52	—
Superior	U. S A.	W9XJL	26.100	11.49	—
Nashville	U. S. A.	W4XA	26.150	11.47	—

News from British Oversea Services (B. B. C.)

Wavelength in Metres	Frequency in kc/s.	Time (I. S. T.)
Special Indian Transmission (Directed to India)		
19.60	15,310	7.30 p. m. (News in Hindustani)
Eastern Transmission (Directed to India)		
16.84 19 82	17,810 15,140	4 30 p. m. to 4,45 p. m.
16.84 19.82	17,810 15,140	6.30 p. m. to 7.00 p. m.
19.82 25 53	15,140 11,750	9.30 p. m to 10.00 p. m.
Part of African Transmission (Directed to India)		
24.92	12,040	11.30 p. m. to 11.45 p. m.
North American Transmission (Not Directed to India)		
25.53 31.25 31.32	11,750 9,600 9,580	4.15 a m to 4.45 a. m.
25.53 31,25 31.32	11.750 9,600 9,580	5.30 a. m. to 5.45 a. m
31.25 31.32 49.10	9,600 9,580 6,110	7.15 a. m. to 7.30 a m.
25.53 31 25 31.32 49.10	11,750 9,600 9,580 6,110	10,00 a. m.

Wavelength in Metres	Frequency in Kc/s	Time (I. S. T.)
Pacific Transmission (Not Directed to India)		
19.66	15 260	11.45 a. m to 12.15 p. m.
25 53	11,750	
31 55	9,510	
16.84	17,810	1.30 p. m. to 2.00 p. m. & 3.00 p. m. to 3.30 p m.
19.60	15,310	
19.66	15,260	
19.82	15,140	
25.53	11,750	
31 55	9,510	

News In English From Abroad

REGULAR SHORT WAVE TRANSMISSIONS

Country	Station	Frequency in Mc/s	Wavelength in Metres	Daily Bulletins (I. S. T.)
America				
WNBI	BoundBrook	17.780	16 87	8 30 p. m. (except Sun.) 10 30 p. m.
WCAB	Philadelphia	6.060	49.50	5,15 a. m. (ex. Sun.) 5.30 a. m.(Sun. only).
WCAB	Philadelphia	9 590	31.28	
WBOS	Millis	9 570	31.35	4 15 a. m.
WCBX	Wayne	17.830	16,83	6 30 p. m.; 7 30 p. m (Sun only)
				8.30 p m. (Sun. only): 8 45 p. m. (ex. Sat, and Sun) 9 30 p. m. (Sat. Sun. only)
				11 30 p. m.
				1 00 a. m (Sunday only)
WGEO	Schenectady	9.530	31,48	1.00 a. m. (Sunday only)
				2 25 a, m. (except Sat and Sun)
				3 55 a. m. (except Sundays)
WGEA	Schenectady	15.330	19 57	5 30 p. m.
				6 30 p. m. (except Sundays)
				10.30 p, m.
				12 15 a. m.
				2 25 a. m. (except Sat. and Sun)
WPIT	Pittsburgh	15.210	19 72	10.30 p. m.

Country	Station	Frequency in Mc/s	Wavelength in Metres	Daily Bulletins (I S T.)
WRUL	Boston	6 040	49.67	5 30 a m. (except Saturdays)
WRUL	Boston	11.790	25.45	3 15 a. m.
WRUL	Boston	15 250	19.67	5 30 a m.
				3 15 a. m.
Australia				
VLQ	Sydney	9.615	31.20	12 30 p. m.
				12 30 a. m.
VLQ5	Sydney	9.680	30.99	6 00 p. m.
				9.00 p. m.
				3 00 a. m.
VLQ2	Sydney	11.870	25.27	10.30 p m.
VLQ7	Sydney	11.880	25.25	12.30 p. m,
				7.30 p, m.
				12 30 a. m.
				3 30 a m.
VLQ8	Sydney	17.800	16.85	11.30 a m.
China				
XGOY	Chungking	11.900	25.21	4.00 p. m.
				4.40 p. m.
				2 00 a. m.
				3.00 a. m.

Country	Station	Frequency in Mc/s	Wavelength in Metres	Daily Bulletins (I. S. T.)
Finland				
OFD	Lahti	6.120	49.02	1.25 p. m.
OFD	Lahti	9.500	31.58	11.45 p. m.
OFE	Lahti	11.780	25 47	2.15 a. m.
OIE	Lahti	15.190	19.75	3 45 a. m.
Hungary				
HAT4	Budapest	9 125	32.88	6 00 a. m (except Saturday)
HAT5	Budapest	9.625	31.17	4.45 a. m. (except Sunday)
				5 00 a. m. (Sundays only)
HAS3	Budapest	15.370	19.52	8 25 p. m. (Sundays only)
Iran (Persia)				
EQB	Teheran	6.155	48.74	12 00 midnight
Japan				
JZJ	Tokio	11.800	25.42	1.35 a m.
JZK	Tokio	15.160	19.79	1.35 a m.
Manchukuo				
MTCY	Hsinking	11.775	25.48	12 30 p. m.
				2 35 a. m.
Nova Scotia				
CHNX	Halifax	6.130	48.94	3.15 a. m.

Country	Station	Frequency in Mc/s	Wavelength in Metres	Daily Bulletins (I. S T.)
Newfoundland				
VONG	St. Johns'	5.970	50 25	3.45 a. m.
Rumania				
	Bucharest	9,280	32.33	3.10 a. m. (except Sundays)
Spain				
FET1	Valladolid	7.070	42 43	1.20 a. m.
EAJ7	Madrid	9.850	30.43	5 00 a. m.
Sweden				
SBO	Motala	6.065	49.46	2.45 a. m.
Thailand				
HSP6	Bangkok	11,715	25.61	7 15 p. m.
Turkey				
TAP	Ankara	9.465	31.70	12.45 a. m.
TAQ	Ankara	15.195	19.74	5.45 p. m.
U. S. S. R.				
	Moscow	7.545	39.76	3.00 a. m. 4.00 a. m

Country	Station	Frequency in Mc/s	Wavelength in Metres	Daily Bulletins (I. S. T.)
RW96	Moscow	9.520	31.51	12.00 midnight
				1.30 a. m.
				3.00 a. m.
				4.00 a. m.
RAL	Moscow	9.600	31 25	5 30 a. m.
RAL	Moscow	10.724	29 59	4 00 a. m.
RAL	Moscow	11 499	26.09	4.30 p. m
RAL	Moscow	11.710	25.62	3.00 a. m.
RAL	Moscow	11.830	25.36	12.03 p. m.
				12.00 midnight
				4.00 a. m.
RNE	Moscow	12.000	25 00	5 30 a. m.
				1.30 a. m. (Sundays only)
				3.00 a. m.
RNE	Moscow	14 720	20.38	4 30 p. m.
				9 30 p. m.
RKI	Moscow	15.040	19.95	5.30 a. m.
RW96	Moscow	15.180	19.76	5 30 a. m.
				12 03 p. m.
				1.30 a. m.
				3.00 a m.
RW96	Moscow	15.715	19.09	4.30 p. m.
RW96	Moscow	18 540	16.18	4 30 p. m.

Country	Station	Frequency in Mc/s	Wavelength in Metres	Daily Bulletins (I. S. T.)
Vatican City	HVJ	6 190	48.47	12.45 a. m.
Yugoslavia	YUA Belgrade	6 100	49.18	2.55 a. m.
Java	PMA	19 38	15.48	6.15 p. m.
Ceylon	VPB Colombo	6.16	48 70	8.00 p. m. and 9.30 p. m.

REGULAR LONG AND MEDIUM WAVE TRANSMISSIONS

Country	Station	Frequency in Mc/s	Wavelength in Metres	Daily Bulletins (I. S. T.)
Bulgaria	Sofia	850	352.9	2 25 a m. (Thursdays and Saturdays)
Hungary	Budapest	546	449.5	3.40 a. m.

Country	Station	Frequency in kc/s	Wavelength in Metres	Daily Bulletins (I. S. T.)
Ireland	Radio-Eireann	565	531	11.15 p. m. (except Sundays) 2 35 a. m. (Sundays only) 2 40 a. m. (except Sundays)
Latvia	Madona	583	514 6	2.30 a. m. (Tuesdas and Fridays)
	Kuldiga	1.104	271.7	2.30 a. m. (Tuesdays and Fridays)
Rumania	Radio Rumania	160	1.875	3.20 a. m. (except Sundays)
	Bucharest	823	364.5	3 20 a. m. (except Sundays)
Spain	Radio-Coruna	968	309.9	5.40 a. m.
Sweden	Motala	216	1.389	
	Stockholm	704	426.1	
	Goteborg	941	318.8	2 45 a. m.
	Falun	1 086	276.2	
Ceylon	VPB Colombo	700	428	8 p m. and 9.30 p. m.

The Continental Morse Code

·—	A
—···	B
—·—·	C
—··	D
·	E
··—·	F
——·	G
····	H
··	I
.———	J
—·—	K
·—·	L
——	M
—·	N
———	O
——.	P
—·——	Q
·—·	R
···	S
—	T
··—	U
···—	V
.——	W
.—.—	X
—·——	Y
——··	Z

.————	1
··———	2
···——	3
····—	4
·····	5
—····	6
——···	7
———·	8
————·	9
—————	0
·· ·· ··	Period
··——··	Interrogation
—···—	Break (Double Dash)
·—···	Wait
·—·—·	End of Message
···—·—	End of Transmission
·—·	Received (O K)
—·—	Invitation to transmit
——··——	Exclamation
—··—·	Bar Indicating fraction
·—·—·—	Comma
———···	Colon
—·—·—·	Semicolon
·—··—·	Quotes
—·——·—	Parenthesis

The "Q" Code

There is an inernationally agreed code which is intended to meet the requirements of international radio communication and is found very useful as a time saving device

In the code that follows if an abbreviation is not followed by a question mark it has the meaning given in the answer column but if the question mark is there the meaning is that given in the question column.

Abbreviation	Question	Answer
QRA ...	What is the name of your station ?	The name of my station is......
QRB ...	How for approximtely are you from my station?	The approximate distance between our stations is......nautical miles (or... kilometers).
QRC ...	What company (or Government administration) settles the account of your station ?	The accounts of my station are settled by the......company (or by the Government administration of......)
QRD ...	Where are you bound and where are you from?	I am bound for...from...
QRG ...	Will you tell me my exact frequency (wavelength) in kc/s (or m.)?	Your exact frequency (wavelength is... kc/s (or ......m.)
QRH ...	Does my frequency (wavelength) vary ?	Your frequency (wavelength) varies.
QRI ...	Is my note good ?	Your note varies.
QRJ ...	Do you receive me badly ? Are my signals weak ?	I cannot receive you. Your signals are too weak.
QRK ...	Do you receive me well? Are my signals good.?	I receive you well. Your signals are good.
QRL ...	Are you busy ?	I am busy (or I am busy with ...) Please do not interfere.

Abbreviation	Questions	Answer
QRM ...	Are you being interfered with ?	I am being interfered with.
QRN ...	Are you troubled by atmospherics ?	I am troubled by atmospherics.
QRO ...	Shall I increase power ?	Increase power.
QRP ...	Shall I decrease power ?	Decrease power.
QRQ ...	Shall I send faster ?	Send faster (... words per minute)
QRS ...	Shall I send more slowly ?	Send more slowly (... words per minute).
QRT ...	Shall I stop sending ?	Stop sending
QRU ...	Have you anything for me ?	I have nothing for you.
QRV ...	Are you ready ?	I am ready.
QRW ...	Shall I tell......that you are calling him on...... kc/s (or......m)?	Please tell ... that I am calling him on ...... kc/s (or......m.)
QRX ...	Shall I wait ? When will you call me again ?	Wait (or wait until I have finished communicating with ......) I will call you at ...... o'clock (or immediately).
QRY ...	What is my turn ?	Your turn is No......(or according to any other method of arranging it.
QRZ ...	Who is calling me ?	You are being called by......
QSA ...	What is the strength of my signals(1 to 5) ?	The strength of your signals is ..(1 to 5).
QSB ...	Does the strength of my signals vary ?	The strength of your signals varies.
QSD ...	Is my keying correct; are my signals distinct ?	Your keying is correct; your signals are bad.
QSG ...	Shall I send...telegrams (or one telegram at a time)	Send......telegrams (or one telegram) at a time.
QSJ ...	What is the charge per word for ... including your internal telegraph charge ?	The charge per word for...is francs. including my internal telegraph charge.
QSK ...	Shall I continue with the transmission of all my traffic, I can hear	Continue with the transmission of all your traffic, I will interrupt

Abbreviation.	Question	Answer
	you through my signals?	you if necessary.
QSL ...	Can you give me acknowledgment of receipt ?	I give you acknowledgment of rceipt.
QSM ...	Shall I repeat the last telegram I sent you ?	Repeat the last telegram you have sent me.
QSO ...	Can you communicate with......direct (or through the medium of...) ?	I can communicate with ...direct (or through the medium of......)
QSP ...	Will you retransmit to ...free of charge ?	I will retransmit to...... free of charge.
QSR ...	Has the distress call received from ... been cleared?	The distress call received from......has been cleared by......
QSU ...	Shall I send (or reply) on.. kc/s (or m.) and/or on waves of type A1, A2, A3, or B ?	Send (or reply) on... kc/s (or...m) and/or on waves of type A1,A2,A3 or B.
QSV ...	Shall I send a series of VVV...?	Send a series of VVV......
QSW ...	Will you send on...kc/s or..... m.) and/or on waves of type A1, A2, A3 or B?	I am going to send (or I will send) on......kc/s (or...m) and/or on waves of type A1, A2, A3 or B.
QSX ...	Will you listen for... (call sign) on......kc/s (or......m) ?	I am listening for...... (call sign) on......kc/s (or......m).
QSY ...	Shall I change to transmission on......kc/s (or ...m) without changing the type of wave ? or Shall I change to transmission on another wave ?	Change to transmission on......kc/s (or......m) without changing the type of wave or Change to transmission on another wave.
QSZ ...	Shall I send each word or group twice ?	Send each word or group twice.
QTA ...	Shall I cancel telegram No...as if it had not been sent.	Cancel telegram No. ... as if it had not been sent.
QTB ...	Do you agree with my number of words.	I do not agree with your number of words; I will repeat the first

Abbreviation	Question	Answer
		letter of each word and the first figure of each number.
QTC ...	How many telegrams have you to send ?	I have ... telegrams for you (or for ......)
QTE ...	What is my true bearing in relation to you ?	Your true bearing in relation to me is ...... degrees
	or	or
	What is my true bearing in relation to...... (call sign)	Your true bearing in relation to...(call sign) is.. degree at... (time).
	or	or
	What is the true bearing of......(call sign) in relation to......call sign)	The true bearing of ... (call sign) in relation to ... (call sign) is ...... degrees at ... (time)
QTF ...	Will you give me the position of my station according to the bearings taken by the direction finding stations which you control ?	The position of your station according to the bearings taken by the direction-finding stations which I control is ...... latitude ......longitude.
QTG ...	Will you send your call sign for fifty seconds followed by a dash of ten seconds on ... kc/s (or...m.) in order that I may take your bearings ?	I will sent my call sign for fifty second followed by a dash of ten seconds on...... kc/s (or ......m)in order that you may take my bearing.
QTH ...	What is your position in latitude and longitude (or by any other way of showing it ?	My position is......latitude ...... longitude (or by any other way of showing it).
QTI ...	What is your true course ?	My true course is ...... degrees.
QTJ ...	What is your speed ?	My speed is......knots(or ...... kilometers) per hour.
QTM ...	Send radioelectric signals and submarine sound signals to enable me to fix my bearing	I will send radioelectric signals and submarine sound signals to enable you to fix your bearing

Abbreviation	Question	Answer
	and my distance ?	and your distance
QTO ...	Have you left dock (or port)?	I have just left dock (or port).
QTP ...	Are you going to enter dock (or port) ?	I am going to enter dock (or port).
QTQ ...	Can you communicate with my station by means of the international code of signals ?	I am going to communicate with your station by means of the international code of signals.
QTR ...	What is the exact time?	The exact time is......
QTU ...	What are the hours during which your station is open ?	My station is open from ......to......
QUA ...	Have you news of ...... (call sign of the mobile station)?	Here is news of......(call sign of the mobile station)
QUB ...	Can you give me in this order, information concerning; visibility; height of clouds, ground wind for ...... (place of observation) ?	Here is the information requested......
QUC ...	What is the last message received by you from... (call sign of the mobile station) ?	The last message received by me from... (call sign of the mobile station) is......
QUD ...	Have you received the urgency signal sent by ...... call sign of the mobile station) ?	I have received the urgency signal sent by......(call sign of the mobile station)at,.(time)
QUF ...	Have you received the distress signal sent by... ... (call sign of the mobile station) ?	I have received the distress signal sent by...... (call sign of the mobile station) at......(time)
QUG ...	Are you being forced to alight in the sea (or on land) ?	I am forced to alight (or land) at......(place)
QUH ...	Will you indicate the present barometric pressure at sea level ?	The present barometric pressure at sea level is ......(units)
QUJ ...	Will you indicate the true course for me to follow, with no wind, to make for you ?	The true course for you to follow, with no wind to make for me is...... degrees at......(time)

Miscellaneous Abbreviations

Abbreviation	Meaning
C	Yes.
N	No.
P	Indicator of private telegram in the mobile service (to be used as a prefix)
W	Word or words.
AA	All after...(to be used after a note of interrogation to ask for a repetition.)
AB	All before...(to be used after a note of interrogation to ask for a repetition.)
AL	All that has just been sent (to be used after a note of interrogation to ask for a repetition)
BN	All between......(to be used after a note of interrogation to ask for a repetition)
BQ	A reply to an R.
CL	I am closing my station.
CS	Call sign (to be used to ask for a call sign or to have one repeated)
DB	I cannot give you a bearing (you are not in the calibrated section of this station.)
DC	The minimum of your signal is suitable for the bearing.
DF	Your bearing at......(time) was......degree., in the doubtful sector of your station, with a possible error of two degress
DG	Please advise me if you note an error in the bearing given.
DI	Bearing doubtful in consequence of the bad quality of your signal,
DJ	Bearing doubtful because of interference.
DL	Your bearing at......(time) was......degrees, in the doubtful sector of this station.
DO	Bearing doubtful. Ask for another bearing later, or at......(time)
DP	Beyond 59 miles, the possible error of bearing may amount to two degrees,
DS	Adjust your transmitter, the minimum of your signal is too broad.
DT	I cannot furnish you with a bearing; the minimum of your signal is too broad.

Abbreviation	Meaning
DY	This station is two-way, what, is your approximate direction in degrees in ralation to this station ?
DZ	Your bearing is reciprocal (to be used only by the control station of a group of direction finding stations when it is addressing other stations of the same group)
ER	Here......(to be used after the name of the mobile station in the sending of route indications)
GA	Resume sending (to be used more specially in the fixed service).
JM	If I may transmit, send a series of dashes. To stop my transmission, send a series of dots (not to be used on 500kc/s; 600m)
MN	Minute or minutes (to be used to indicate the duration of a wait.
NW	I resume transmission (to be used more specially in the fixed service)
OK	Agreed-
RQ	Designation of a request.
SA	Indicator preceding the name of an aircraft station (to be used in the sending of particulars of flight)
SF	Indicator preceding the name of an aeronautical station.
SN	Indicator preceding the name of a coast station,
SS	Indicator preceding the name of a ship station (to be used in sending particulars of voyage)
TR	Indicator used in sending particulars concerning a mobile station.
UA	Are we agreed ?
WA	Word after...(to be used after a note of interrogation to request a repetition)
WB	Word before...(to be used after a note of interrogation to request a repetition)
XS	Atmospherics.
YS	Your service message.
ABV	Repeat (or I repeat)the figures in abbreviated form
ADR	Address (to be used) after a note of interrogation to request a repetition)
CFM	Confirm (or I confirm)
COL	Collate (or I collate)
ITP	Stops (punctuation) count.

Abbreviation	Meaning
MSG	Telegram conceıning the service of a ship (to be used as a prefix)
NIL	I have nothing for you (to be used after an abbreviation of the 'Q' code to mean that the answer to the question is negative.
PBL	Preamble (to be used after a note of interrogation to request a repetition.)
REF	Referring to......(or Refer to......).
RPT	Repeat (or I repeat) (to be used to ask for or to give repetition of all or part of the traffic, the relative particulars being sent after the abbreviation.)
SIG	Signature (to be used after a note of interrogation to raquest a repetition.)
SVC	Indicator of service telegram concerning private traffic for to be used as a prefix.)
TFC	Traffic.
TXT	Text (to be used after a note of interrogation to request a repetition.

Colour Codes

Fuse Colour Code

Fuses of different current carrying capacities are designated by colours:—

Current carrying capacity	Colour code
60 mA	Black
150 mA	Red
250 mA	Brown
500 mA	Yellow
750 mA	Green

Current carrying capacity	Colour code.
1 Amp.	Dark Blue
1·5 „	Light Blue
2 Amps.	Purple
3 Amps	White
5 Amps	Black & White

Condenser Colour Code

This colour code is applied only to fixed mica condensers. Three coloured dots are put on the condenser on the trade mark side. The dots are read from left to right and the value thus obtained is in $\mu\mu f$. The code is as follows:—

Colour	Figure
Black	0
Brown	1
Red	2
Orange	3
Yellow	4

Colour	Figure
Green	5
Blue	6
Violet	7
Grey	8
White	9

The interpretation of the three dots reading from left to right is as follows:—

1st dot.—first figure of the condenser value

2nd dot.—second ,, ,, ,, ,, ,,

3rd dot.—the number of zeroes following the first two figures,

Example:—

First dot	*Second dot*	*Third dot*	*value μμf*	*value μf*
Black	Brown	Black	1	.000005
Black	Green	Brown	50	.00005
Orange	Green	Brown	350	.00035

Resistance Colour Code (R. M. A.)

The standard RMA Colour Code is used to designate resistance values. This method has saved manufacturers a vast amount of money in the past. Ten colours are assigned to the figures, as shown in the table.

First Figure		Second Figure		Ciphers	
0	Black	0	Black	None	Black
1	Brown	1	Brown	0	Brown
2	Red	2	Red	00	Red
3	Orange	3	Orange	000	Orange
4	Yellow	4	Yellow	0000	Yellow
5	Green	5	Green	00000	Green
6	Blue	6	Blue	000000	Blue
7	Purple	7	Purple		
8	Grey	8	Grey		
9	White	9	White		

The body of the resistance is coloured to represent the first figure of the resistance value.

One tip of the resistor is coloured to represent the second figure of the resistance value.

A dot located within the body colour, represents the number of ciphers following the first two figures.

Example:—

A 25000 ohm resistor would have a red body green tip and orange dot.

Standard Battery Cable Colour Code (N. E. M. A.)

Coloured connecting wires are used for battery operated receivers. The wire code that follows is not universally used but it has been adopted by the manufacturer members of the National Electric Manufacturers Association (N. E. M. A.) U. S. A.

L. T. +	Yellow
L. T. -	Black with yellow tracer
H. T.+max	Red
H. T.+int	Maroon and red
H. T.+det.	Maroon
H. T. -	Black with red tracer
G. B. +	Green
G. B. - low	Black and green
G. B. - max	Black with green tracer
Loudspeaker	High side Brown, low side Black with Brown tracer running through.

Abbreviations

Abbreviations used for Components and Circuits

A. C.	Alternating Current
A. F.	Audio Frequency
A. V. C.	Automatic Volume Control
A. F. C.	Automatic Frequency Control
A. S. C	Automatic Selectivity Control
D. C.	Direct Current
D. C. C.	Double Cotton Covered
D. P. D. T.	Double Pole Double Throw
D. P. S. T.	Double Pole Single Throw
D. S. C.	Double Silk Covered
E.	Earth
G. B.	Grid Battery or Grid bias
H. F.	High Frequency
H. T.	High Tension
I. F.	Intermediate Frequency
K. W.	Kilowatt
L. F.	Low Frequency
L. S.	Loudspeaker
L. T.	Low Tension
P. D.	Potential Difference
Q. A. V. C.	Quiet Automatic Volume Control
Q. P. P.	Quiescent Push Pull
R. F.	Radio Frequency (same as H. F.)
S C. C.	Single Cotton Covered
S. I. C.	Speciafic Inductive Capacity
S. P. D. T.	Single Pole Double Throw
S. P. S. T.	Single Pole Single Throw
S. S. C.	Single Silk Covered
S. W. G.	Standard Wire Gauge

Standard Abbreviations for Units and Constants

A	Ampere	K	Specific Inductive capacity
Ω	Ohm	Z	Impedance
V	Volt	f	Frequency
W	Watt	c/s	Cycles per second
F	Farad	m	Metres
H	Henry	ω	$2 \times \pi \times f$
C	Capacity	λ	Wavelength
L	Inductance	dB	Decibel
M	Mutual Inductance		

Prefixes for Unit Abbreviations

M	mega—	means one million	1,000,000
k	kilo—	means one thousand	1,000
m	milli—	means one thousandth	1/1,000
μ	micro—	means one millionth	1/1,000,000
$\mu\mu$	micromicro-	means one billionth	1/1,000,000,000,000

Conversion Table

Ampere	1,000 milliamperes
Farad	1,000,000 microfarads
Henry	1,000,000 microhenry
Kilocycle	1,000 cycles
Kilovolt	1,000 volts
Kilowatt	1,000 watts
Megacycle	1,000,000 cycles
Microfarad	·000,001 farad
Microhenry	·000,001 henry
Microvolt	·000 001 volt
Milliampere	·001 Ampere
Millihenry	·001 Henry
Ohm	1,000,000 micro-ohms
Volt	1,000,000 microvolts

Some Useful Equations

Relating to Ohm's Law (for D C)

(1) Amperes $= \dfrac{\text{Volts}}{\text{Ohms}}$

(2) Milliamperes $= \dfrac{\text{Volts x 1000}}{\text{Ohms}}$

(3) Ohms $= \dfrac{\text{Volts}}{\text{Amperes}}$

(4) Ohms $= \dfrac{\text{Volts x 1000}}{\text{Milliamperes}}$

(5) Volts $=$ Amperes x Ohms

(6) Volts $= \dfrac{\text{Milliamperes x Ohms}}{1000}$

Concerning Resistances

(7) Connected in Series:—

Total resistance $= r_1 + r_2$

(8) Connected in parallel:—

Toral resistance $= \dfrac{1}{\dfrac{1}{r_1} + \dfrac{1}{r_2}}$

or $= \dfrac{r_1 \times r_2}{r_1 + r_2}$

Concerning Energy dissipation (D. C.)

(9) Amperes $= \dfrac{\text{Watts}}{\text{Ohms}}$

(10) Millamperes $= 1000 \times \sqrt{\dfrac{\text{Watts}}{\text{Ohms}}}$

(11) Watts $= \text{Amperes}^2 \times \text{Ohms}$

(12) Watts $= \text{Volts} \times \text{Amperes}$

Concerning Condensers

(13) Connected in series; as formula 7

(14) Connected in parallel; as formula 8

(15) Reactance of a condenser to A. C.:—

$$\text{Ohms} = \frac{1{,}000{,}000}{6.28 \times \text{frequency} \times \text{microfarads}}$$

Concerning Chokes

(16) Reactance:—

Ohms $6{\cdot}28 \times \text{Frequency} \times \text{Henries}$

Relating to Wavelength and Frequency

(17) $\text{Metres} = \dfrac{300{,}000{,}000}{\text{Cycles per second}}$

(18) $\text{Cycles per second} = \dfrac{300{,}000{,}000}{\text{Metres}}$

(19) $\text{Metres} = 1885 \times \text{Microhenries} \times \text{Microfarads}$

(20) $\text{Kilocycles} = \dfrac{159{\cdot}2}{\text{Microhenries} \times \text{Microfarads}}$